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DESCRIPTION vs. STATEMENT OF MEANING

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By the 'description' of an object we mean an account so full and so definite that one to whom the object itself is unfamiliar can nevertheless, given skill and materials, reconstruct it from the verbal formula. Every discriminable part or feature of the object is unambiguously named; there is a one-to-one correlation of symbols and the empirical items symbolised; and the logical order of the specifications is the order of easiest reconstruction. This, then, is what we mean by 'description' in psychology; and the meaning is brought out, clearly enough, by the adjectives—'analytical and abstractive'—which are applied to psychological description in current discussion. Psychological description is analytical, in that the given consciousness or part-consciousness is analysed into its elementary constituents, into sensations, images, attitudes, etc.; it is also abstractive, in that the inseparable attributes of these elements or of their groups (quality, intensity, form of combination, etc.) are specified in the report.[1] The objects described may be very different: we may be interested in the variation of some quantitative attribute of a single sensation, or in the temporal course and

[1] Sometimes the 'abstractive' means that psychological analysis is itself abstractive, that the psychological elements or complexes are not real separables; but if this is the point to be made, the current phrase is 'abstractively analytical' rather than 'analytical and abstractive.' At all events, the point does not concern us here.

confluence of a group of processes, or in the cross-section of a total consciousness: in every case, description consists in the unambiguous coupling of every phase or item of our conscious experience with a word, in such wise that a reader of normal mental constitution can reproduce the experience for himself.

It may be doubted whether we have attained to complete description in any department of psychology; it may, indeed, be doubted whether complete description, implying as it does the adequate rendering of the continuous by the discrete, is not in the last resort a contradiction in terms. Fortunately, however, completeness of description is not necessary to scientific advance. When we have carried our analysis and abstraction as far as present methods allow, we can sum up the results in collective terms, and thereafter employ these terms for descriptive purposes; we can speak, in the given case, of 'feeling of familiarity' or of 'verbal idea,' referring to previous analyses for detailed description. It is not even necessary that these previous analyses agree: two observers may report a 'conscious attitude,' or a 'form of combination,' or a 'feeling of relation,' although they differ widely in their view of the nature and composition of what they observe; and the reports may be of value to a descriptive psychology. This procedure may be continued, until we reach the "conceptual shorthand" of which Pearson speaks:[2] we are still describing, because we are going on the assumption, expressed or understood, that the road to the ultimate terms of description is always open, that we can work back from our concepts to our point of departure,—practically, to the attitudes and forms and feelings from which we agreed to start, theoretically to the elementary processes and irreducible attributes whose verbal correlates furnish the most nearly 'complete' description of which the science is capable.

Psychological description, however, is never easy; the verbal formulas of the most highly trained observers are likely to be imperfect; every new investigation leads to a new result. Moreover, psychological description is often warped by prepossession; we have a host of terms—secondary criteria, stimulus error, logical reflection, laboratory atmosphere, faculty tradition, pleasure-pain dogma, associationism, sensationalism, intellectualism, and many more—that are used by critics to stigmatize the bias of the observer. Certain forms of prepossession take shape within psychology; certain others

[2] K. Pearson, *The Grammar of Science*, 1900, 504; *cf.* E. Mach, *Popular Scientific Lectures*, 1895, 193, etc.

are prior to any psychological observation; the observer is not simply a psychologist, but moves, so to say, in various worlds, of which the psychological is at best only one, and may be one of the less familiar; it is natural, then, that, confronted with a difficult task, he should be tempted to adopt an attitude more habitual than that of psychology, and to offer as psychological description a report which in fact is not psychological at all. The temptation to this shift of attitude is, indeed, exceedingly strong; for the situation in which the psychological observer is placed bears a close resemblance to situations which arise outside of psychology, and which must be met by all of us every day of our lives.

It is difficult, at this point, to keep the discussion at the empirical level; but I shall try, at any rate, to steer clear of epistemological complications. The observer moves, I said, in various worlds. Now it is clear that the world which is most familiar, and to which our response is most direct and certain, is the world in which we were brought up as children; the world of things and people, of boats and trains, of relatives and strangers, of quarrels and reconciliations, of successes and failures. No doubt, this world is modified as we grow older; our attitude to it changes with increase of our scientific knowledge. But it is never identical either with the world of physics or with the world of psychology: for physics deals, not with boats and trains, but with masses and distances and velocities; and psychology deals, not with quarrels and successes, but with emotions and voluntary actions. And the difference between the world of practical life and the world of science is reflected in their languages: for in scientific description, words are labels of facts; in daily intercourse, they are signs of import.

I may, perhaps, be permitted to fall back upon an illustration. A half-trained observer, attempting his first bit of serious introspection, will probably report that at first he was 'puzzled,' that he sat for some time in a blank 'perplexity.' He is told forthwith that a report of 'puzzle' or 'perplexity' will not do; the terms are not introspective terms. 'Why?' he asks; 'are they not the name of an emotion?' And then comes the teacher's task of explanation. The word 'puzzle' or 'perplexity,' he points out, gives him the key to the observer's predicament, acquaints him with the import of the situation, enables him to handle it, shows the need of just the kind of comment that he is now beginning; but the word tells him nothing whatsoever of the observer's individual experience, of the particular 'feels' that constituted the per-

plexity in the particular case. It is a word that he perfectly well understands; and this apprehension of its import is not only sufficient, but is also the one thing necessary, for the affairs of everyday life, for social intercourse, for the regulation of behavior. Scientific description, on the other hand, is always an instrument of reconstruction; and as psychological observation is individual observation, the description must also be individual; the reader of the observer's report must be able to reconstitute, to reconstruct, the perplexity which is therein described, precisely as it was lived. The word 'puzzle' is not, then, a descriptive label; it does not attach, without ambiguity, to certain conscious processes in a certain arrangement; if the reader seeks to interpret it descriptively, he finds himself free to invent or imagine processes and arrangement in terms of his own mental constitution; whereas a description would tie him down, item by item and phase by phase, to a specific perplexity whose course and composition might differ, in various ways and to various extents, from what was usual with himself. The distinction is, I hope, plain; it is not worth while to pursue the illustration further. But it may be worth while to formulate again the conclusions to which the illustration leads. These are, first, that the word 'puzzle,' as used by the half-trained observer, is not a psychological term at all; it is a sign of the import of a practical situation; and, secondly, that the very same word 'puzzle' may be used, by a trained observer, as a shorthand expression for observed psychological occurrence; it is then a descriptive term, a label of fact. The ultimate test, in cases of doubt, is the user's ability to expand the term to a descriptive formula, or at least to trace it back in descriptive fashion to the conventional starting-point of the discussion. If the observer has previously analysed perplexity into localised organic and kinaesthetic processes, affective concomitants, verbal ideas, and so forth, then the term may (under the conditions of a particular experiment) be accepted as descriptive; if it has been agreed between experimenter and observer that the 'conscious attitudes' are to be taken for granted, then the report 'attitude of perplexity' may, again, be accepted as descriptive. But the word as employed by our half-trained observer is descriptive neither in fact nor in intention: not in fact,—for there is no guide to descriptive reconstruction; but not, either, in intention,—for the observer shows, by its employment, that he has missed the point of the exercise; he is trying to express the import of the situation rather than its experienced *quale;* he

has not realised the difference between psychologising and behaving.

The attempt to be empirical makes one longwinded; and I have no doubt that exception may be taken to many of my phrases. I am satisfied if the reader has clearly in mind the distinction that I am drawing; and I have tried to exhibit the distinction in a way that is independent of school or system. I turn now to the special subject of this paper: the appearance of description and of what I shall call 'information' in the recent experimental psychology of thought. I know of no English word that may, in this connection, be opposed, naturally and as a matter of course, to the word 'description;' but we may say provisionally that a term like 'perplexity,' when it is not descriptive, conveys information, is informatory.[2a]

I begin—readers of the JOURNAL will not require a preface—with the relevant passages in Dürr's critique of Bühler. In rough translation, they run somewhat as follows:

"I have followed the course of Bühler's investigation, in which I was privileged to take part as observer, with keen interest. And I have been led to a rather curious result, which has altogether changed my ideas of the best method for the conduct of thought-experiments. Again and again, as I was observing for Bühler, I had the impression, though I was not able at the time to formulate it very clearly, that my report was simply a somewhat modified *verbal statement* of the thoughts aroused in me by the experimenter, and that this verbal statement could not properly be regarded as a psychological description of the thoughts. What I mean by this antithesis of 'verbal statement' and 'psychological description' will perhaps become clearer if I suggest that the layman in psychology would be giving introspective reports every time that he exchanged thoughts with a friend, unless there were some difference between verbal expression and psychological description. The introspecting psychologist will not, of course, be satisfied with a bare mention of the content of his thought during the experiment; he will specify the sensations and ideas that may have appeared in the course of his thinking; and he will refer to the content of his thought in such a way as to make it clear that the experience was a thought-experience. He will say: The thought came to me that . . . , or I had the consciousness that . . . , or It occurred to me that . . . , etc. But it is evident that to designate something a thought is not by any means to describe the nature of this thought. No doubt, we increase our stock of psychological knowledge when we learn that mental processes which are neither verbal ideas nor imaginal complexes of any other sort, nor yet feelings, may enter consciousness in relative isolation and independence, and that these processes are fittingly designated thoughts. But we do not owe this

[2a] I take advantage of my proof-sheets to remark that the above paragraphs have answered, by anticipation, the special question asked by R. P. Angier, *Journ. of Philos.*, etc., ix, 1912, 137. The general subject of introspection must stand over for a later article.

discovery to Bühler's investigation. Bühler's aim is not merely to verify a familiar fact; he means psychologically to describe the thoughts of whose occurrence he was assured before the work began. . . .

"The report shows that real thinking does not move with the wearisome parade march of formal logic. Logical schematism ravels out the close-packed tissue of thoughts. The practised thinker does not laboriously abstract the particular from the universal, but in a single act apprehends the universal and the particular in the universal. These are interesting facts, that may be turned to especially good account for a less dead-and-alive presentation of logic in our text-books. But they contribute nothing to a psychological description, to an analytical or abstractive definition of the experience in which the apprehension of the relations between particular and universal is given. . . .

"The problem of the psychologist is to show the characteristics of all these acts of thought, not by reference to what is apprehended in them, but by demonstration of their proper nature. This question Bühler leaves unanswered."[8]

Dürr's 'verbal statement' is, then, an intimation of the content or object of thought; it corresponds to what I have spoken of above as 'information.' As 'somewhat modified' by psychological environment, it contains a reference of the observer's experience to a general psychological heading, to the category of Thoughts. If our half-trained observer had reported, not simply that he was puzzled, but that he 'felt' puzzled, or had a 'feeling' of perplexity,—and if he used the word 'feeling' in some psychological sense,—then he would have done, at his lower level, precisely what Dürr does in Bühler's investigation. The 'perplexity' is informatory, refers to content or import; the 'feeling,' used as a psychological rubric, is, so far as it goes, descriptive. Dürr's intimation of content, he gives us to understand, is psychologically irrelevant; the phrases that came before the intimation (I had the consciousness that . . . , etc.) are psychological, but they bring us only to the threshold of a true psychological description.

I pass on to von Aster. An experience, von Aster says, may be characterised in two different ways.

"This twofold characterisation is explained as follows. On the one hand we are able, in the strict sense of this term, to *describe* the experience, just as we describe objects at large: by comparison, by grouping it with similar experiences, by emphasising particular features. But secondly, the experience may be *communicated* by some special word [or phrase]. Which of these characterisations, now, is the better, the more accurate? Which of them brings the experience nearer to us, gives us the more intimate familiarity with it? [It must be remembered that] every *description* of an experience has, of necessity, some-

[8] E. Dürr, Ueber die experimentelle Untersuchung der Denkvorgänge. *Zeits. f. Psychol.*, XLIX, 1908, 315 f., 322, 323. Italics mine.

thing rough, awkward, incomplete, about it: that is why we are glad to exchange it for communication. Over against a conscious attitude or an affective state, description and communication stand to each other in the same relation as description and delineation over against a physical thing. Description names and defines the parts; but the parts, when put together, never yield the whole; while the drawing, and the communicating phrase, give the whole in unitary form. Communication is superior to description, just precisely as the depiction of mental states by the poet is superior to that offered by the psychologist." [4]

To quote a passage of this sort is not quite fair to the writer, who works out his position gradually, by means of examples. Since, however, I want him to speak for himself, I venture to translate a few significant sentences,—with the confession that they are torn from particular contexts, and with the recommendation that the article be read as a whole.

(1) "It is not necessary that the observer have any conscious realisation of the difference between description and communication. The problem is, to pin down a certain series of experiences; and communication, if it is characteristic, satisfies the conditions even better than description. That is to say, expression of the communicative kind suits the disposition aroused in the observer by the instructions given, and is therefore accompanied by a very positive 'consciousness' that the task set 'has been satisfactorily performed.'" [5]

(2) "Description has always an approximative character, which comes out with especial clearness when the experiences are as difficult to arrest [as they are in the thought-experiments]; communication has, oftentimes, the character of high assurance, of a certain self-evidence." [6] Even when the report directly 'names' the contents of consciousness, and is therefore properly to be called descriptive, "the verbal expression may carry a direct conscious reference to the imaginal complex, and yet there may be a clear 'consciousness' of the insufficiency of the image; the words mean more than is given in this image." [7] But communication, too, has its difficulties. "Sometimes the reproduction is assured and definite; phrases crop up with the consciousness, That is precisely what the experience 'meant.' At other times the assurance and self-evidence are lacking; I say that the experience contained 'thoughts' which I may 'perhaps' express as follows, or which 'seemed' to take this or that direction. And finally it may happen that I begin with a rough paraphrase of what was 'meant,' and that then the 'right' or 'fitting' expression suddenly suggests itself." [8]

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[4] E. von Aster, Die psychologische Beobachtung und experimentelle Untersuchung von Denkvorgängen. *Zeits. f. Psychol.*, XLIX, 1908, 69. The reader may be reminded that Dürr's critique was read at the Frankfurt Congress in April, 1908; that von Aster's paper, already at that time completed, was published in September of the same year; and that Dürr's article followed in October.

[5] *Ibid.*, 70; cf. 72.

[6] *Ibid.*, 71; the writer is contrasting the attitudes of the observers in Marbe's and Bühler's experiments.

[7] *Ibid.*, 72 f.

[8] *Ibid.*, 93.

(3) It is sufficiently plain that communication is not description; but the writer adds an emphatic statement of their incongruity. "Since communication, with whatever assurance it may be made, is not of itself a *description* or a direct identification, the question now arises, *What* experiences, then, gave rise to this communication?"[9] And as we cannot infer experience from communication, so we cannot either infer 'meaning' from description. "The mere consideration of the facts of consciousness, the experiences, which accompany the 'intelligent' utterance of a sentence, need tell us nothing at all—at all events, need not inform us completely—of the content of our 'meaning.'"[10]

(4) As to the nature of communication itself, there can be no doubt that it is an expression of import. The words "Oh, yes,—that is one of those paradoxes of Nietzsche's" communicate a repugnance, an impatience, an indifference; that is, they give the import of a situation which they fail altogether to describe.[11] The whole essay might be quoted in support of this conclusion. Here, for instance, is a relevant passage: "What do these observations [of Messer and Bühler] show? On their face, they show nothing more, again, than that experiences were present which the observer communicates by certain verbal expressions, and—to particularise—by expressions regarding the object designated by the [stimulus] word:" it is the import of the stimulus word that is communicated.[12] But we have the writer's direct testimony: "What Dürr here calls 'verbal statement,'" he says, "I call 'communication.' And Dürr's assertion that Bühler's observers took up, not a descriptive, but a communicative attitude, is the more noteworthy, as Dürr was himself one of these observers."[13]

Bühler, in his rejoinder to these criticisms, refuses to identify 'verbal statement' and 'communication.' "Von Aster thinks that his 'communication' is the same thing as what Dürr means; but that can hardly be correct."[14] There is, undoubtedly, this difference: the phrase 'verbal statement' has an intellectualistic ring; the word which I have translated 'communication' carries rather, in the German, an affective reference,—implies a sort of self-revelation or self-betrayal, such as is given by the 'expression' of emotion. I do not think, however, that the difference can be stressed. And I do not think that, on any view, it is essential: it seems to derive simply from a difference of psychological system. In the sphere of Bühler's thoughts, Dürr operates with a 'relational consciousness,' von Aster with affectively toned atti-

[9] *Ibid.*, 102; cf. 77.
[10] *Ibid.*, 82.
[11] *Ibid.*, 65 ff.
[12] *Ibid.*, 85; similar expressions occur, *e. g.*, 86, 90.
[13] *Ibid.*, 107. The words for 'communicate,' 'communication' are *kundgeben, Kundgabe.* I hope, however, that no reader will be satisfied to accept my translations; the terminology of this chapter of psychology is still so unsettled that, in the last resort, recourse must always be had to the original German.
[14] K. Bühler, Zur Kritik der Denkexperimente. *Zeits. f. Psychol.*, LI., 1909, 117 f., and ref. to Ber. d. III. Kongr. f. Psychol.

tudes and with direct impressions of sameness, relation, etc. Dürr, then, naturally speaks of a 'somewhat modified (i.e., grossly psychological) verbal statement,' and von Aster speaks as naturally of '(expressive) communication.' The 'verbal statement' and the 'communication' as such are, I believe, what I have called 'information;' the 'somewhat modified' and the implied 'expressive' give a psychological turn to the information, the former accenting thought, the latter rather accenting feeling. Here, of course, I am interpreting; but the interpretation is nothing more than a generalised reading of the facts; and if doubt remains it must be doubt, not of the rightness of the interpretation, but of its ability to mediate between von Aster and Bühler. 'I am saying, in my own way,' von Aster declares, 'just what Dürr said;' and Bühler replies: 'No, you are saying something else.' I have shown, now, that there is a difference; but I ascribe it solely to the personal standpoint and preoccupation of the critic; it is not, so far as I can see, a difference of criticism.

Meanwhile, it is notorious that the criticism has failed to convince those against whom it was directed; we are still told that there appear in consciousness, from the point of view which reveals perceptions and feelings and ideas, processes that can be named, labelled, described, only as 'Bewusstsein von,' 'Wissen um,' and so forth; we are asked to include thought-elements, relation-elements, awarenesses, in our analytical vocabulary. This state of affairs suggested the modification of method which was described by Jacobson in the last volume of the JOURNAL. The observers in certain experiments were asked to separate 'description of process' from 'statements concerning meaning.' The word 'process' is here used in the sense of the German *Erlebnis;* it was thoroughly familiar to the observers; whereas "no definition of 'meaning' was furnished by the experimenter." The instruction ran: "Put direct description of conscious processes outside of parentheses, and statements concerning meanings, objects, stimuli and physiological occurrences inside." I wish to emphasise the fact that the observers were hereby required to put *all* conscious processes (including thoughts and awarenesses, if these occurred as processes) in the one report, and to put in the other—not 'meanings' outright, but—*statements concerning meanings.* To have separated, at the outset, 'process' and 'meaning' would have been to beg the question at issue; for 'meaning,' whether passive as 'signification' or active as 'intention,' might appear in

direct experience as a specific form of process. On the other hand, a 'statement concerning meaning' is clearly an informatory, not a descriptive statement; its banishment from the introspective record is therefore justified; and its removal should indeed, beside freeing the introspective report from irrelevancies, call attention to *lacunae* in that report itself.

I do not propose to discuss in detail the results of Jacobson's paper. The general outcome is that there are no 'significations' or 'intentions' to be found among the processes; that "the correlated meanings and processes are two renderings, from different points of view, of one and the same experience;" that 'meanings,' in other words, must always be 'stated,' and cannot be 'described;' and that a report from which the 'statements of meanings' have been removed is not on that account descriptively inadequate. In connection with this general result, however, there were three points in particular which seemed to me to need working out. They are as follows:

(1) "F at first showed occasional uncertainty as to what constituted meaning; and D for some time showed occasional doubt and inconsistency. Eventually, however, the reports of all four observers became practically uniform." How are we to explain this uncertainty, doubt, inconsistency?

(2) "Just as processes flit by on the passing instant, so do meanings change and elude the observer; and the skill in expression of meaning acquired in daily life is comparatively rough and superficial." How, exactly, do meanings 'change?' Do they slip into one another, in the manner of dissolving views; do they shift abruptly; do they behave in both these ways? Is there any marked difference between change of process and change of meaning?

(3) "We find that wherever there is meaning there are also processes; and we find that the correlated meanings and processes are two renderings, from different points of view, of one and the same experience." What are these 'points of view?' Jacobson expressly decides to leave this question open. I do not know whether, on the basis of his material, it could have been answered; and if that is the case, I do not know what his own answer would be. What I have to say upon the question is, therefore, said upon my own sole responsibility, and does not commit Jacobson in any manner. I thought it worth while to attempt an empirical characterisation of the two attitudes, or points of view, taken by the observers; and Miss Day and Mr. Foster—the D and F of Jacobson's paper—very kindly put themselves at my disposal

for these observations and for those demanded by (1) and (2) above. Three sorts of experiments were made, with words and sentences as stimuli: in some, the observer gave first a full statement of meaning, followed by a report (as complete as could be managed) of process; in others, this order was reversed; in yet others, the two reports were intermingled, so that description of process and statement of meaning alternated, as they had done in Jacobson's experiments. It was understood that these new experiments were to be performed with the same seriousness and conscientiousness as the old; the observers knew, however, that they would be required, upon the basis of the whole work, to characterise the attitudes aroused by the different instructions. The task was difficult,—how difficult, I did not myself know until I had attempted it; and although we all three realise that the results are imperfect, I must add that they taxed to the utmost the training and goodwill of the observers.

(1) The following are excerpts from the observers' answers to the question as to the reason for their uncertainty and doubt at the beginning of Jacobson's experiments.

Observer D.—There was, as I remember, a general hesitancy at entering upon a new field; I had never before been asked to make the twofold report, and I could not approach the task coolly and with assurance. . . . More important, though, was my uncertainty as to what the instruction really was; no definition of 'meaning' was given. I was inclined to suspect *E* of a bias toward logic, and I had been taught to regard logical reflection as the worst enemy of introspection. On the other hand I knew that in some instances his psychological terminology had differed from that to which I was accustomed. At first, therefore, I was not a little troubled by doubt as to what he meant me to do when he said "State the meaning" of the word or sentence. . . . I suspect that I am naturally rather a 'subjective' observer, and dependent upon instructions; it sometimes requires a decided effort for me to accept a situation passively, without personal reference to *E* and to what he wants me to observe. My uncertainty led me to take up now one attitude and now another. At times, acquiescing as I thought in *E*'s view, I sought for the verbal, dictionary definition (words were then the stimuli); at other times I stubbornly followed my own natural bent, and waited passively for the stimulus to appear meaningful. . . . After a while, I found that the meanings came of themselves, and I gave them as they arose; as *E* made no comment, I assumed that I was thus following instructions, and the experiments became less trying and fatiguing. . . .

Observer F.—At first I had difficulty in placing the parentheses in the report according to rule, because, even with the best phrasing of which I was then capable, the report did not fall clearly into two such divisions. Obscurity, unitariness, swiftness of passage of complexes; the large amount of material to be reported upon before it slipped from memory; lack of command of language, both for direct description and for statement of meanings: these and other practical conditions led me often to use what I should call indirect or indicative description.

So I reported an auditory image 'more as if whispered than as if said in ordinary voice,' kinaesthetic images or sensations 'such as I get when standing and bending the right leg,' etc.; and I found it hard to decide, at first, whether these clauses should go inside or outside of parentheses. Later the difference between statement of meaning and indirect description became clearer; but in some early reports there was a mixture of standpoints; 'vague,' applied to an image, for example, meant vague descriptively and also vague logically. . . . Secondly, and more importantly, I was not always sure as to the *extent* of the meaning, whether of the meaning actually present or of the meaning called for by the instructions. I did not know what purpose was implied in the instruction to state meanings. One may, I think,—though I realised this less clearly at the time,—state the meaning of a situation variously according to the purpose which is involved, the basis which is presupposed. There is a narrow meaning with reference to the individual experiment and to myself as observer; there is a wider meaning with reference to the day's work, and the working relations between the experimenter and myself; and there are many other meanings, with reference to yet other aspects of life. I felt that these meanings were different, and I did not know whether some of them were irrelevant or whether I was to think out, to search for, all possible meanings. It is not so much, I believe, that "the skill in expression of meaning acquired in daily life is comparatively rough and superficial" (though this statement is, no doubt, true in a certain measure), as rather that the situations of daily life define their own universe of meaning, supply of themselves a basis for meaning; whereas the instructions in our experiments left this universe undefined. . . . I finally settled down to the narrow, directly experimental, meaning, but I had all through a sort of mental reservation, to the effect that other and wider meanings might be made out.

The replies need no interpretative comment. It is interesting, however, to note the difference of type,—a difference which led D to remark, at the conclusion of the experiments, that statement of meaning is easier than report of process, and F to make an emphatic declaration to the contrary. The task of description, always difficult, is especially difficult for an observer who leans toward the subjective type; and D, when she has once satisfied herself that she clearly understands the demand for meanings, falls back upon their statement with some relief. F, an observer of a somewhat extremely objective type, relies on his training for the report of processes; if he cannot describe everything, he will describe what he can. But the request for meanings puzzles him: *what* meaning shall he state? the perception of a letter? the perception of a letter as stimulus in a thought-experiment?—where shall he draw the line of meaning? So D reports, characteristically, that the meanings 'came of themselves,' while F insists that meanings are always matter of reflection, have to be sought for, to be decided upon. And D is able to use a foregone statement of meaning to help out

her later description of process, while F finds that the prior formulation of meaning tends to drive process out of mind.

(2) I quote again from the replies of the two observers.

Observer D.—The meanings in these experiments are perfectly definite and discrete things, distinct from one another. There is no stage of transformation of one meaning into another, but rather a 1-2-3 sequence with a clean-cut division between the individual meanings. There may be difficulty in expressing a given meaning in words, but this is due to unreadiness of language; and a meaning may quickly give place to another meaning, but with practice it can be caught and expressed. Meanings are not transitory in the way that processes are, but are inherently stable; and they are not inherently elusive, as many processes are, but are very get-at-able. They are cut-and-dried, as it were dead things. . . . We can make rough distinctions between groups of processes, but I question whether this is not due, genetically at least, to the fact that the 'group' has been isolated because it had a 'meaning.' There is no gradual development or dying away of a meaning; it is all there at once. A mental complex, on the other hand, as it shows itself to introspection, rises, becomes more or less prominent, dies away; its part-processes and attributes undergo continual change throughout its course.

Observer F.—It is quite true that the meaning of a word or sentence may be different, and logically complete in different stages, at different times. . . . Thus, when the stimulus was the sentence 'What time is it?' the meaning for practical purposes was first present, and then the meaning was realised in more adequate form (in reference to my university work) with the coming up of suitable images. In this sense, then, I agree that meanings may "change and elude the observer." . . . There is also a sort of emphasis within a total meaning: thus the meaning may be emphatically that of 'the letter *d*,' while at the same time there may be a qualification 'on white' or 'on white paper' or 'on a white ground.' If the emphasis shifts, so that the subordinate becomes the principal meaning, there is also, of course, a 'change of meaning.' . . . I have never noticed, however, that meanings overlap or pass into one another; the meaning is, I think, always this or that, at any particular moment. Thus, the word *hide* gave, as report of process, "kinaesthetic sensations as of contraction in shoulder muscles downward in crouching; slight organics in abdomen; then vague visual image of rounded white surface of small extent in front and to the right." The 'then' reads as if there were a sharp break in consciousness; but there was not. On the other hand, the shift of meaning from 'crouch' to 'human skin,' and therewith from verb to substantive, was definite and abrupt. . . .

The difference of type is again apparent. For D, there is no question of 'range of meaning,' of 'logical completeness in different stages;' she assumes, quite as a matter of course, the range set by the requirements of the *Aufgabe*, i.e., by the experimenter; the meaning is hard and fast, without power to contract or expand, and without internal emphasis and subordination. F, on the other hand, reports changes of meaning which at once suggest the logical terms intension and extension. Despite this difference, the observers agree

that change of meaning, unlike change of process, was complete and immediate.

It would, of course, be unwise to generalise these results, though there can be no harm in drawing from them the old lesson that, when we are trying to further psychology, we must be constantly on guard against the irruption of logic. Logical common-sense, *c'est l'ennemi.* If, however, the results are borne out by those of other enquiries, we have a new light cast upon such phrases as "a conflict of meanings," "the meaning of the telegram gradually dawned upon him," etc. During a conflict of meanings, for instance, whatever might be the tangle of contextual processes to be unravelled by introspection, we should have the meanings themselves at any single moment clear-cut and distinct; and the dawn of meaning would not be a gradual and continuous unfolding of meaning, but a step-wise progress involving what I have, perhaps rashly, identified as intension and extension. In both experiences there might be periods of meaninglessness, such as have been found in previous experimental work and have been verified in our own observations; but, if a meaning were present, of whatever logical 'stage of completeness' and of whatever 'range,' that meaning would be self-contained, rounded off, untainted by intermixture of other meanings, replaced by and not dissolving into its successor or alternative.

(3) I come, finally, to the empirical characterisation of the two attitudes.

Observer D.—(1) The statement of meaning is much *easier to make* than is the report of process. There was a definite bodily reaction (slight nausea, inhibited breathing) to giving a long and full account of processes, as if to a difficult, laborious, irksome performance. The statement of meaning, on the other hand, came easily, without effort or unpleasant affection. In particular, (*a*) meanings are definite, and arrange themselves easily in sequence, whereas it is difficult to be sure of the temporal order of processes. (*b*) The statement of meanings is comparatively simple; there are fewer meanings than processes; a single meaning often corresponds with a large budget of processes. One is therefore sure of the completeness of a statement of meaning, while one often has the uncomfortable feeling that a process-account is scrappy and imperfect. (*c*) Meanings seem to go naturally into words; the phrasing takes care of itself. One has to be very careful of one's vocabulary in reporting processes.

(2) The two accounts stand in a different relation to each other. The statement of meaning is altogether *independent,* and can be made without any thought of process. I find, however, that even when I am trying to hold strictly to the attitude of reporting processes I am tempted to refer to meanings, in order to make the description complete and chronological; I resist this temptation, as I am sure that the meanings are extraneous to introspection. Where the statement of meaning (as in some of the new experiments) is given first, it offers

itself as a skeleton on which I may reconstruct the process-account; it promises to give shape and organisation to that account; and I cannot help making some use of it.

(3) Besides these differences of degree, there is also a difference in kind. It is the natural, everyday thing to converse in terms of meaning and it is, for me at least, natural to remember in those terms. While, therefore, the introspective attitude is *analytical*, the meaning-attitude is not analytical (or synthetical) at all, but just matter of course; the expression takes place immediately, without hesitation, as if automatically. It would never occur to me that I might analyse or put together a given meaning; a meaning is a unit, complete in itself, which would not exist if broken up in any way. . . . So I do not 'observe' meanings; the word implies a more active attitude than is correct for meanings; I take the meanings as given to me from without. The difference is, I suppose, one of *Aufgabe;* but it is not the contrast of two kinds of *Aufgabe* within a psychology; when I turn to meanings I drop psychology, and fall into the naïve, receptive attitude of everyday life.

Observer F.—(1) *Analytical and non-analytical.* During an experiment, certain processes rise into prominence, have a unity of some sort, seem to 'belong together,' then die down gradually and give place to another group of processes; there may be several of these 'conscious presents.' We can analyse the groups or complexes, and find the individual component processes within the unity; we are able to say that now this and now that part-process came or went. On the side of meaning there is no such possibility; the meaning, as opposed to the conscious complex or conscious present, stands as a unit which cannot be analysed; these is no sense in which it can be regarded as 'made up of' constituent meanings. As a meaning for a definite purpose, it stands as individual and irreducible. . . . This 'belonging together' on the side of consciousness, and 'single direction towards an end' on the side of meaning, are what lead us to make paragraphs or breaks in the twofold report.

We can say that a reported meaning is 'partial,' if we compare it, say, with a verbal definition; but this does not mean that the logically complete meaning can be analysed into partial meanings. We can say also that a meaning shows difference of emphasis; but this does not mean, again, that it is made up of two meanings; the subordinate or qualifying aspect is always integral to the meaning as individual.

(2) *Kinetic and static.* Processes move; they begin and grow and end. They have attributes, and the attributes show continuous change. Meanings are static; they do not proceed or grow; they merely are. They do not possess attributes, as processes do. One could arrange meanings on scales, either of internal emphasis or of extent; but one would then be arranging different meanings; the series would be discrete.

Processes may be present simultaneously, and may run parallel in time. I cannot think of a situation in which two meanings were present at once.

Processes, in such formations as the conscious attitudes, run together into condensations; meanings stand as blocks, with rather sharp breaks between them.

(3) *Observed and acknowledged.* I observe mental processes much as I do physical processes; live the experience through, under *Aufgabe;* and then write down a one-to-one report, so far as that is possible. This comes fairly easily, so far as I have the names at command and am familiar with the processes to be named. Meaning, however, is not

a conscious fact any more than it is a physical fact. Meanings and physical things may be represented in consciousness, but they do not form part of consciousness. They cannot, then, be observed, as processes are, but must be thought out. If the superficial, common-sense meaning alone were required, the meaning report would be easy enough; but when an exact statement of meaning is called for, I have to think it out; to go over the experience again and again, asking myself: Did I realise this? To what extent, for what purpose, did I realise it? I then acknowledge the meaning, as something implied, as a reference of my experience to other experiences under a purposive aspect; I do not observe it, as something existing.

In other words, the difficulty of the report of process is the same that one has in physics; one knows, from other experiments or from reading, that certain things may be overlooked, on account of conditions, or that certain things may be read in, on account of bias. The difficulty is itself familiar, and can be met by a fitting variation or repetition of the observations. An exact statement of meaning requires a very different attitude, one of logical reflection, of weighing possibilities, of setting limits; it is easy to say 'I knew' or 'I felt' or 'I wished' thus and thus, in general terms, but it is very hard to work out how well, how fully, I knew; what was the precise content of the wish, etc. The meaning, as I said, is always a matter of implication; I assent to it, or reject it; I do not observe it. When once the meaning has been found, however, one is sure that one has it all,—a rather rare feeling in reports of complex processes.

(4) *Definite and indefinite.* I have already said that to 'find' a meaning, with any exactness, one must circumscribe one's task; meanings widen out in increasing circles. My own restriction of meaning to 'such meaning as expresses strictly and directly these particular processes' came well toward the end of Jacobson's experiments, and only after I had tried, for some time, to state exactly other and various ranges of 'meaning at large.' With processes the task is quite definite; one is to describe all that are there, or one is to restrict oneself (by instruction) to some group or phase.—

I may summarise by saying that the psychological *Aufgabe* in these experiments was to observe, analytically, a given continuum of processes. The other, and what I should call the logical *Aufgabe*, was to state the meanings which reflection found implicit in certain (practically important) moments of the continuum.

It is clear, I think, that these observers, when asked for an empirical characterisation of the attitudes, sought — as, indeed, how should they not seek? — to psychologise their answers; the empiricism to which they appealed would, naturally, be that of psychology. The result is an attempt to differentiate, in terms of introspection, two attitudes—the one of which lies beyond the scope of introspection. I find it, then, all the more significant that both observers expressly give up the appeal to psychology; D makes the meaning-attitude a non-scientific, everyday matter, and F refers it to logic. But, in point of fact, the appeal to psychology breaks down from the start. Ease and difficulty, analysis and non-analysis, stationariness and elusiveness, definiteness and indefiniteness, all

these antitheses may be found within psychology itself. Their use in the reports, however, plainly transcends psychology. What, for instance, does D mean to contrast under the rubric of ease and difficulty? Not a psychological difficulty and a psychological ease; but rather psychological difficulty in general and a certain non-psychological ease, the facility of ordinary conversation. F, too, does not need to be informed that there are psychological formations, *e.g.*, perceptions, of a relatively static character; when he contrasts 'kinetic' with 'static' he has in mind general psychological elusiveness and general logical stability. And what holds of these, holds also of the other oppositions which appear in the reports.

The reader of the reports themselves will note—and may make the fact a ground of objection—that nothing is said of the carriage of the *Aufgabe* in the fore-period. Here, if anywhere, it might be supposed, a psychological difference between the two attitudes should appear. There is, however, a sufficient reason for its absence. In all psychological experiments of this kind, the *Aufgabe*, as I have remarked in another place, is couched in informatory terms; the observer is 'informed' that he is to introspect; and, responding to the informatory attitude of the experimenter, makes no effort to translate the instruction into terms of description.[15] That is the natural course of events. But let an effort be made to introspect the contents of the fore-period: what have we gained? We simply get, over again, the distinction with which we are familiar from the main period, the distinction of 'report of process' and 'statement of meaning.' The appeal to the fore-period is therefore unavailing.

In conclusion, it may be pointed out that the two observers, in spite of their typical difference, come to substantially the same result as regards the sphere to which the stated meanings belong. D, who takes them the less seriously, tells us that they are the meanings of our daily life and conversation; F, that they are logical meanings. I need not argue that there is no contradiction; but I may remind the reader that Messer, in seeking to discriminate the psychology from the logic of thought, finds a half-way house in "the attitude which we assume in intercourse with our fellow-men."[16]

[15] *Thought-processes*, 1909, 268.

[16] A. Messer, *Empfindung und Denken*, 1908, 163 ff. "Es wird sich empfehlen, sozusagen stufenweise zum Standpunkt der Logik emporzusteigen. Am zweckmässigsten werden wir wohl den Ausgang nehmen von dem Verhalten, das wir im Verkehr mit unseren Mitmenschen zu deren Denken einnehmen."

Summary.— It has been recognised, in recent studies of the processes of thought, that the observers' reports contain material of different kinds: introspective description, and information or communication. There is, however, no general agreement as regards (1) the line of division between the two modes of report, (2) the nature of the conscious processes underlying 'information,' or (3) the attitude which finds expression in 'information.'

E. Jacobson (this JOURNAL, XXII, 1911, 553 ff.) requires his observers to distinguish between 'description of process' and 'statement of meaning.' He thus secures (1) a line of division in their reports. He finds (2) that there are no specific 'meaning processes' underlying the statements of meaning.

On the basis of new experiments, I have sought (3) to characterise the attitudes implied in, or demanded by, the two modes of report; the one attitude turns out to be that of descriptive psychology, the other that of logic or of logical common sense. The latter attitude I take to be essentially the same as that involved in Dürr's 'verbal statement' and von Aster's 'communication.'

Certain facts brought out in the course of these experiments indicate that there is a rich field for introspective study in the consciousnesses underlying 'conflict of meanings,' 'the gradual dawning of a meaning,' 'misunderstanding,' 'the inability to make oneself understood,' and so forth.

ANALYSIS OF CONSCIOUSNESS UNDER NEGATIVE INSTRUCTION[1]

By L. R. Geissler

In connection with reaction-experiments on association and reproduction with normal[2] and abnormal[3] subjects, H. S. Langfeld has recently employed and studied that kind of negative instruction which requires the suppression of the name of a perceived object. The problem of the negative instruction and its relation to recent investigations of the conscious attitudes, the thought-processes, and other similar topics, seemed to us of such importance as to deserve a special and more detailed study for its own sake. Our aim was, therefore, first to repeat Langfeld's experiments with greater emphasis on detailed introspections, and then to introduce such variations of conditions as might be expected to throw further light on the analysis of consciousness under negative instruction and in particular on the nature of the suppression.

The experiments were performed in the Psychological Laboratory of Cornell University during the summer session of 1911, by Mr. F. G. Tappan,[4] instructor in Electrical Engineering and candidate for the degree of Ph. D. The repetition of Langfeld's experiments was made as nearly identical with the original as possible; the only appreciable difference was that we worked in daylight and had an electric fan-motor running whose faint but constant noise veiled any unavoidable distractions. Among our four observers was Miss L. M. Day, a graduate student in psychology, who had attained a high degree of practice in the experiments on Meaning conducted by Dr. Jacobson,[5] in the previous year. Another

[1] From the Psychological Laboratory of Cornell University.

[2] Suppression with Negative Instruction. *Psychol. Bull.*, VII, 1910, 200-208.

[3] Suppression with Negative Instruction. *Psychol. Rev.*, XVIII, 1911, 411-424.

[4] The writer gladly takes this opportunity to thank Mr. Tappan for his skill and patience in carrying out the work, his care and pains in calculating and summarising the quantitative results, and his general interest in the progress of the investigation.

[5] On Meaning and Understanding. *Amer. Jour. Psychol.*, XXII, 1911, 553-557.

highly practised observer was the present writer, who likewise had taken part in these experiments and who besides had several years' experience in introspective work. The two remaining observers were students of the Summer School, Miss E. Forchheimer, instructor in the department of Education at the Normal College of the City of New York, and Mr. N. M. Sharpe, a senior in Cornell University, who had attended several lecture and laboratory courses in the department of psychology. These four observers had, then, various degrees of practice in introspection; they will be referred to, although in a different order, under the letters A, B, C, and D.

The exact conditions of our first series of experiments were as follows. The observer sat before a large, black, wooden screen behind which in a rectangular opening a picture could be exposed by moving a small cardboard screen, usually covering the opening, quickly and noiselessly upwards. All other surroundings, including the experimenter himself, were hidden from the observer's sight by black curtains. Before every exposure the experimenter read Langfeld's instruction in a calm, indifferent tone of voice. Then he said "Ready," waited a second, gave the signal "Now," and after another second raised the small screen and started the stopwatch. As soon as the observer began to give the associated reaction-word the stopwatch was stopped, and the screen dropped again. Shortly afterwards the observer dictated his introspection, in as detailed a manner as he was able, and if possible in the same temporal order in which the experiences occurred. No questions were asked, except in cases of obvious misunderstanding. As in Langfeld's work, the introspections extended mostly over the mid-period; that is, from the first perception of the picture up to the completed reaction. In a second series of experiments the introspections covered sometimes the fore-period and sometimes the after-period. The observer never knew beforehand what he would be expected to give, as we thought it more important to avoid any kind of change in the contents of consciousness due to such previous knowledge than to facilitate introspective analysis at the risk of varying the state of consciousness by predetermination. The fore-period began with the signal "Ready" and stopped at the first perception of the picture, while the after-period started with the first articulation of the reaction word. The other experimental conditions of this second series of observations were the same as those of the first series.

The principal change in our third group consisted in the substitution of actual objects for the pictures. For that purpose the black wooden screen was replaced by a black curtain behind which the object was placed. The observer's right elbow rested on the table so that the lower arm was also behind the curtain. At "Ready" the hand was raised, while the experimenter silently put the object in its place. At "Now" the hand moved quickly downward, and as soon as it came into contact with the object the stopwatch was set off, and stopped again with the beginning of the reaction. Twenty objects were presented on two successive days in the following order: tennis ball, electric dry cell, pack of loose cards, pocket-knife, electric bulb, scissors, tobacco pipe, teaspoon, comb, spool, watch, shoe-horn, ink-bottle, blackboard-eraser, glass, fountain-pen, cotton-wool, bunch of keys, alarm-clock, pencil. The instructions were modified correspondingly and the introspections extended over the total period from the "Ready" to the end. In the last series, finally, the instruction was reversed into its positive form, to read: "Do not react with any word except the name of the object." The following twenty objects were used: book, saucer, pencil, clamp, pliers, silver dollar, fork, compass, mucilage-tube, toy-pistol, apple, rubber-stamp, nail-file, screw-driver, ruler, marble, checker, cartridge, nail, pencil-eraser.

We may consider first a few quantitative results. The data from the first series agree very closely with those of Lang-

TABLE I. REACTION-TIMES

No. of Series	Obs.	No. of Expts.	Average	MV	Range	S. Ss.*
I.	A	67	1.75	± .40	.9–9.1	67
	B	81	1.60	± .45	.6–7.0	81
	C	67	1.75	± .45	.9–3.4	67
	D	67	1.40	± .40	.6–2.7	65
III.	A	20	2.25	± .65	1.1–4.0	19
	B	19	2.40	± .80	.6–4.2	19
	C	20	2.90	± .80	1.1–4.4	20
	D	19	2.90	±1.50	1.0–9.0	19
IV.	A	23	2.90	± .70	.7–15.0	—
	B	20	3.50	±1.85	1.1–12.7	—
	C	23	2.90	±1.45	.7– 9.0	—
	D	23	3.50	±2.75	.9–17.0	—

*This column gives the total number of successful suppressions.

feld, indicating that the change to daylight conditions had no appreciable influence upon the results. The only noteworthy difference is that three of our observers had no, and the fourth only two, unsuccessful suppressions of the forbidden name of the object. Statistical tables on the frequency of certain kinds of imagery are of no significance for our particular purpose and are therefore omitted, especially as we have satisfied ourselves that they reveal nothing different from those given by Langfeld. The average reaction-time, its mean variation, and its range may be seen from Table I. The same table shows also the average reaction-time, mean variation and range for the experiments of the third and fourth series, in which objects were used. The numbers in the fourth, fifth, and sixth column are seconds.

It is natural that the touch-reactions should be relatively slow, on account of the delayed recognition of the objects by touch; but it is surprising to find the reactions with positive instruction slower than those with negative instruction. The only exception is observer C, whose times are identical in both series, although even here the fourth series shows a larger mean variation and range. The reason for this unexpected difference between the third and fourth series will become plain from the introspections. There is only one unsuccessful suppression in the third series, with A, who reacted to the object fountain-pen with the word pen. In none of our series does the reaction-time show any tendency to become shorter with practice; in fact, some of the maximal times occur toward the end of a series.

Turning now to the qualitative analysis of consciousness under an instruction, as revealed by our introspective records, we may most appropriately begin by a comparison of Langfeld's data with those obtained by us under nearly identical conditions. Langfeld finds "all forms of suppression from a fully voluntary act to a purely automatic reaction," and distinguishes in this development eight different groups or stages, adding, however, that "the different forms are scattered throughout the different days and the different subjects." He would probably not maintain that these groups or stages are the only ones, or that they are all of equal frequency or significance. Our own records verify most of his stages; but we can not find any parallel to his fourth group, in which the recollection of the negative instruction is sufficient to inhibit even the kinaesthetic image of the forbidden name. Some of his illustrations of this group seem to show, however, that the name of the object must have been present in conscious-

ness, if not as a kinaesthetic image, then in some other form. Consider, for example, the following introspection: *Cannon-Gun.* "Idea of cannon. Recalled that I was not to say cannon, so said gun." What is the "idea of cannon" in this case? In other examples, the term kinaesthetic image does not always seem to be used in the same way. In one case we read, for example, "kinaesthetic image of cards. Suppressed it, etc.," and in another case: *Horse-Cow.* "Kinaesthetic image of horse. As to the suppression, the word simply did not come, etc." Here the 'kinaesthetic image of horse' seems to be something different from the word horse, while in the case of the cards the pronoun 'it' refers to the image, and no word is mentioned. Similar cases occur on p. 207: *Teeth-Gum.* "Kinaesthetic image of false teeth. Should have said these words, etc." What, then, is this kinaesthetic image, and what is really suppressed? Langfeld does not describe the suppression itself; his conclusions refer mostly to its development only; how the suppression takes place is not stated. In this respect we believe that our repetitions and variations of Langfeld's experiments form a necessary supplement to his work. In order to give the reader a more concrete idea of the sort of consciousness involved in the reaction to a negative instruction, we have summarised the introspections of our four observers under each one of our various conditions, and have added in footnotes samples of introspections to illustrate points of special significance.

INTROSPECTIONS ON THE MAIN-PERIOD (REPETITION OF LANGFELD'S WORK)

Observer A.

The perception and recognition of the object usually arouse its name in internal speech. Sometimes there is a strong kinaesthetic tendency to say the name, which consists chiefly in actually initiated movements[7] of the tongue and lips.—In 8 cases the name of the object is not in consciousness.

The suppression following is sometimes attitudinal, containing kinaesthetic strains and pressure sensations in the palate, organic sensations and inhibited or irregular breathing, muscular rigidity of mouth and lips and general tension of the muscles involved in articulation (this occurred usually in focal clearness).[8] Sometimes the suppression is

[7] *Pipe—Tobacco,* 1.2 sec. "Kinaesthetic tendency to say pipe, with lips closed for 'p.' Then vague visual image of Mr. F., leading to verbal idea: 'tobacco—pipe' and said tobacco . . ."

[8] *Carriage—Wheel,* 1.5 sec. "Internal speech: 'carriage.' State of confusion, eyes moving over picture, mouth half open as if catching my breath, held breath, strong pressure in region of soft palate, tendency to pronounce carriage, at least ready for k-sound as the beginning of this word. . . ."

ideational, consisting mostly of verbal ideas fleeting through the focus of consciousness, as "I must not say so and so," or "What can I say?" or longer comments on possible reaction words, etc.[9] In later experiments (of this group) the suppression is sometimes replaced by an attitude of hesitation which is analysed into organic sensations from the diaphragm-region, and muscular strains from frowning and vague staring at the picture. The whole attitude is unpleasant.[10]

This stage is sometimes followed by an active attitude of search, consisting of the resumption of strong eye-movements and many verbal ideas, mostly commenting critically on the difficulty of the situation, as "this is absurd," or the like.[11]

The actual articulation of the resulting reaction-word is sometimes anticipated either in internal speech or as a verbal idea. Sometimes, especially when there has been no suppression, the reaction takes place automatically either as the result of a common-place word association, such as table-chair, where table is the name of the pictured object, or as the name of that part of the picture which has been in the focus of both attention and vision.[12] The reaction may be accompanied or followed by feelings of relief, satisfaction, surprise, familiarity, etc. Occasionally verbal memories enter, or verbal ideas either criticising or justifying the reaction-word with reference to the instruction,[13] for example, "this word is all right," "perhaps I ought to have said so and so," etc.

Observer B.

Immediately upon the perception of the object its name arises verbally in auditory-kinaesthetic form. This is followed in the earlier experiments by "incipient" throat, tongue and lip movements, which later drop out while the auditory-kinaesthetic idea of the word remains.—In 15 of the 81 experiments no name of the object is present in consciousness.

Then a "muddled feeling" with inhibition or irregularity of breathing and slight organic nausea occur, while the eyes are rapidly working

[9] *Violin—Bow,* 1.9 sec. "First thing on sight of picture was 'violin' in pronounced internal speech. Then in verbal idea 'must not say that' and word 'bass' came, but immediately the verbal idea 'this may be a bass, oh what can I say?' Then period of waiting with strong organic sensations about diaphragm and abdominal wall, very unpleasant. Finally, with a feeling of relief, the verbal idea 'oh yes, bow is o. k.' and said bow."

[10] See end of previous introspection.

[11] *Wheelbarrow—Move,* 1.5 sec. "No name suggested itself. Word 'move' in internal speech was first word after period of search when eyes wandered over picture with occasional fixation, frowning, holding breath, uneasy and unpleasant. . . ."

[12] *Trolley car—House,* 1.1 sec. "Word 'house' was suggested in internal speech by long row of windows before I recognised the picture as a street-car. There was no suppression, only a slight hesitation with vague eye-movements and wrinkling of forehead, all slightly unpleasant. Then repeated 'house' as a reaction-word."

[13] *Pail—Water,* 1.3 sec. "Word 'bucket' in internal speech with tendency to say it and moved lips. Then verbal idea: 'inside of bucket' led at once to pronunciation 'water' with a sort of surprise to myself. Then a feeling of satisfaction, with a mental nod of agreement to it, meaning 'yes, that's all right,' all slightly pleasant."

over the picture.[14] The meaning of all this is: "must not say that word."[15] In later experiments a brief verbal remembrance of the instruction "you are not to name the object" takes its place, and finally itself disappears.

This is followed by a period of search for a reaction-word, consisting of strains in head, much internal speech and unpleasantness.[16] In later experiments the eyes begin to fixate habitually only a part of the picture, as the result of the positive part of the instruction, while the rest of the picture is barely noticed,[17] and the verbal idea of the name of the fixated part occurs with it in auditory-kinaesthetic form, anticipating the reaction.

The articulation of the reaction is often accompanied by a feeling of relief, and usually followed in internal speech by the justification: "this word is all right," implying a reference to the instruction. Toward the end of this series of experiments the habit of naming the accidentally fixated part is so strong that the whole reaction is automatic and just barely conscious. But in difficult situations the earlier conscious complexity returns.

Observer C.

The perception of the object arouses its name, mostly in internal speech, kinaesthetically. Frequently this is accompanied by clear visual imagery of similar objects, esp. those owned or recently experienced by the observer. At the same time many other visual and verbal memory-associations fill the background of consciousness.—In 15 cases no name of the pictured object occurred.

Then follows in some cases either an attitudinal suppression[18] whose main contents are muscular strains from "tightness of the throat" and "incipient" movements to say the forbidden name, or an ideational suppression in kinaesthetic-verbal ideas, as "must not say it" or a partial repetition of the instruction.[19]

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[14] *Trumpet—Tube*, 2.2 sec. "Word 'trumpet' came right away in auditory-kinaesthetic terms. Decided throat-movements, incipient tongue and lip-movements, inhibited breathing, nausea, rapid working of eyes, all meaning 'must not say.' Looked around for something else, with strains in head, all this unpleasant. Word tube as auditory-kinaesthetic idea came with feeling of relief, mildly pleasant, and deeper breathing. Then said tube."

[15] See preceding introspection.

[16] *Fork—Handle*, 1.5 sec. "Word 'fork' came first in auditory-kinaesthetic idea. No tendency to say it aloud and no suppression. Eyes moved along picture, strains in head, organic complex rather unpleasant and meaning 'hunting for word.' Eyes then fixated handle and this word came to consciousness with feeling of relief."

[17] *Automobile—Wheel*, 0.6 sec. "Eyes fixated at once hind wheel and the word came in auditory-kinaesthetic idea and said it very automatically."

[18] *Corn-ear—Succotash*, 1.7 sec. "Had to suppress 'cob,' which kept ringing in my ears. Was conscious of a breeze in room, of strains in eyes, and of tightness in throat. Could not say anything else, had to grope around for word (Experimenter's note: O made an actual sound like 'ugh'). Then a visual image of white dish of succotash and said it."

[19] *Drum—Stick*, 1.1 sec. "Word drum came in internal speech, then verbal idea 'must not say that.' Fixated the drum-stick and said 'stick' with feeling of satisfaction that instruction was followed."

Sometimes a period of waiting, suspension and search follows, which is not further analysed, but is usually marked by strong unpleasantness. The reaction is usually the result of fixating and naming in anticipatory internal speech some prominent or peculiar part of the picture or of a visual image of great vividness.[20] The reaction is followed by a vaguely pleasant attitude or feeling of satisfaction and by verbal and visual memory-associations.

Observer D.

The perception and recognition are accompanied or followed by the name of the object, occurring either in internal speech or as a kinaesthetic "tendency" in the form of initiated lip and tongue movements.[21] —In 5 cases no name of the object occurred.

Then, in a few cases only, a kinaesthetic attitude of suppression occurs, whose clearest constituents are pressure sensations of nervously pressing hands and heels together or of rigidly closing the lips.[22] In most cases, however, there is a rich flow of associated ideas (in visual, auditory, and kinaesthetic-verbal terms) of similar objects owned or recently experienced by the observer. Frequently there occurs also a specialised, self-set problem to choose the most appropriate association as a reaction.[23]

This choice may take place with or without conscious effort or search. Several, mostly unsuccessful attempts were made to name some part of the object.[24] The reaction is often anticipated in auditory terms, a few times in internal speech. Sometimes it is automatic. In some instances it is accompanied by a vaguely pleasant satisfaction or an unpleasant feeling of doubt or uncertainty. This leads then to verbal comment of self-criticism or justification of the reaction word.

This summary shows that the mid-period can easily be divided into two or three sub-periods, which we may call the stage of recognition, the stage of suppression, and the stage of search, suspense, or hesitation. This is followed by the after-period with its stage of reaction. In the case of ob-

[20] *Automobile—Steering-wheel,* 2.0 sec. "As soon as I saw picture visualized a red car I had seen recently. No name of object in consciousness. Visual image of the steering wheel came as part of the whole and esp. vivid as my eyes fixated that part of the picture, then reacted."

[21] *Electric fan—Breeze,* 2.2 sec. "Word 'electric fan' came in internal speech and almost said it, had some effort to suppress it by closing lips. Then word 'breeze' came automatically, perhaps because I had used it in previous introspection."

[22] See preceding introspection.

[23] *Automobile—Fast,* 2.5 sec. "Said 'automobile' in internal speech and tried to think of a manufacturer. Made effort to find one, pressing of thumbs and contraction of toes, was conscious of wasting time to find name of manufacturer, with a feeling of embarrassment. Finally the word 'fast' came automatically without choice and no internal speech with it. Also needed no effort of suppression."

[24] *Piano—Steinway,* 0.9 sec. "Said 'piano' in internal speech and 'Steinway' came at once because my piano at home and one here is Steinway. Had intended to describe part of picture, but cannot do it, either forget it or am unable to do it."

servers A, C, and D, the second and third stages gradually merge into each other, while with B the second stage drops out entirely, because this observer tended to neglect the negative aspect of the instruction and fell into the habit of always naming a part of the exposed picture (in accordance with the positive part of the instruction: "you may describe it or name any of its parts"). In his second article[25] Langfeld finds the same tendency occurring among his observers, so that he now omits the relevant passage in the instruction.

The first point of significance in our introspections is that the negative instruction does not inhibit the rise of the forbidden name into consciousness. There are only 43 cases out of 282 experiments, that is, about *fifteen per cent,* in which no name of the object occurred; and some of these are due to failure of recognition. The structural form in which the name appeared varies both in kind and in degree. In a few extreme instances real movements of articulation are made and the first letter is actually pronounced. More often, however, the articulatory movements are only initiated by bringing the vocal organs, as the palate, tongue, teeth and lips, into the right position for pronunciation. This requires usually a few very delicate movements, neither visible nor audible to another person, and an interruption of breathing, especially after inspiration, the "catching of one's breath," with its kinaesthetic-organic effects. This sort of experience is called by some observers "incipient pronunciation," by others a kinaesthetic "tendency" to pronounce the name. It shades off by degrees into "internal speech," where most of the kinaesthetic constituents have lost their sensory and assumed an imaginal character. This telescoping and abbreviating process makes it possible that internal speech usually involves more than one word, so that more or less complete grammatical sentences occur in it. The organic sensations are still present as a vague, unitary complex, although actual respiratory disturbances are rarely perceived by the observer himself. As soon as all kinaesthetic elements have given way to corresponding images and all organic remnants have dropped out, the name of the object is said to be a mere "verbal idea." Often auditory images of the sound of the word fuse with it, and the whole complex becomes rather vague and flashlike. Together with the visual perception and an occasional vaguely pleasant feeling of familiarity, it constitutes the recognition-stage. The observers experience no

[25] Ibid., p. 411.

difficulty in detecting the presence of the forbidden name and in distinguishing between its various kinds and degrees of complexity. It is evident from the results that a successful suppression does not mean the prevention of the occurrence in consciousness of the forbidden name, or the breaking up of the associative tendencies between the perception and the verbal name of an object. It might be possible to reach this stage after many months of continuous practice; but even then the result would be due, not so much to the force of a negative instruction, as to the substitution of other associational habits, set up either by a positive element in the instruction or by a new special task which the observer intentionally assigns himself.

The failure of the negative instruction to keep the forbidden idea entirely out of consciousness is counterbalanced by the successful suppression of the motor discharge; that is, the inhibition of the reaction of articulation. This effect is brought about in two different ways, which may be called the *attitudinal* form of suppression and the *ideational* form of suppression. The former consists mainly of kinaesthetic strain and pressure sensations in the back of the mouth, by some called "tightness of the throat," and probably identical with the "locking of the muscles of the throat" mentioned in Langfeld's reports,[26] of general bodily tension and rigidity about the lips, and of inhibited breathing, especially immediately after inhalation. The strong pleasant feeling of relief often accompanying the reaction is due to a sudden, almost explosive loosening of this muscular tension. In the case of A the release of the throat-setting frequently resulted in reactions beginning either with a guttural sound, such as carriage, gas, Gordon, clock, etc., or with a sound due to the previous position of the speech-organs as locked after initiating the forbidden name, for example, drum-pipe, saw-hammer, ship-boat, etc. Similar instances occur also with other observers, as the introspection 21 with D seems to show. In the case of D the muscular tension due to suppression is usually more widespread. The following is an illustration of an extreme case: *Typewriter-Hamilton.* "On sight of picture said 'typewriter' in internal speech and tried to think of manufacturer of one. Was not conscious of suppression of 'typewriter.' Said 'Hamilton' but was not sure that it was the name of any when I said it. Am not sure now

[26] One of his observers writes: "active suppression by slight locking of the muscles of the throat," and another says: "suppressed it by closing the mouth and putting the tongue against the roof of the mouth."

concerning the suppression, *because remember the contraction of toes and striking the heels together and moved nose up*. Had no visual image of typewriter, but was conscious of intricate mechanism, have never seen one like this."

The ideational form of suppression consists chiefly in some verbal repetition of a part of the instruction, as "you are not to name the object," or in phrases like "wonder whether so and so is all right," "perhaps so and so might do," etc., or in the words of Langfeld's observers: "thought I should not say it," and the like. These ideas issue immediately in the stage of search, which in its briefest form is made up of eye-movements over the picture, restlessness, and further verbal ideas, all toned unpleasantly, until some particular idea or internal speech lends itself to a reaction-word which is finally pronounced. In this connection it is noteworthy that, if such ideas occur immediately upon the naming of the picture, the observers remark explicitly that no suppression was required, presumably because the idea of the name of the object is so intimately associated to the subsequent ideas as to lead at once to them. This is, for example, the case with such common-place associations as chair-table, etc. Here, then, as well as in the ideational form of suppression, the immediate motor discharge of the forbidden idea is directed into other ideational channels and thus delayed and changed; but the entire absence of an idea of instruction leads the observers to the statement that there had been no suppression. They thus imply that the idea of the instruction "must not say so and so" acts or functions as a suppression, or better inhibition, of the motor discharge, and conversely, that the attitude of suppression means the same thing as the idea "must not say it." Indeed, this fact of identity in meaning is explicitly mentioned by B, and there is no doubt in the writer's mind that, if the other observers had been asked whether there was any meaning in the attitudinal suppression-consciousness, they would have given the same answer. At least, the writer is clear in his own case; and the introspection on 'typewriter' by D, quoted above, can fairly be interpreted in the same way. Here the first statement of the absence of suppression is afterwards corrected because of the recollection of the attitude. From Langfeld's introspections several instances can be quoted that confirm this position; for example: *Comb-Hair*, ". . . locked the muscles of the throat after thinking that I must not say the word"; or *Sleigh-Ride*, ". . . thought I should not say it. Locked muscles and then said ride." It is true that these

two examples do not tell us how the observers 'thought' of the instruction, or in what processes its meaning was carried; but the word 'thought' suggests that they were indicating meaning rather than giving an analytical description.

From our own records, however, it is clear that the attitude of suppression means just as much "must not say so and so" as the ideational suppression. Meaning in the case of the attitude, then, is carried by an organic-kinaesthetic complex; the two are the same thing looked at from two different points of view, namely from that of logic and that of psychology. Perhaps the following analogy will help to an understanding of the difference of standpoint. Suppose that in a dog ready to bark a similar organic-kinaesthetic complex could be aroused at the critical moment by some sort of gesture made by his master, or by some other visual stimulus, and that it really should prevent the dog from barking. Should we be willing to attribute to the dog's consciousness the thought, "I must not bark?" We may be perfectly willing to admit that the dog has sensations and sensation-complexes similar to ours, but we should consider it absurd to assume that the dog's mind could interpret its experiences from such different points of view as those of logic and of psychology. Even the human mind still finds difficulty in recognising and separating the two standpoints. The difficulty is enhanced by our use of words and verbal ideas, because in this case the experience considered merely as a spoken or ideated word is so intimately interwoven with the meaning of the word that only the most subtle processes of abstraction can distinguish between the purely existential or psychological and the logical or rather teleological aspect of the same experience. The climax of this difficulty, however, occurs when the verbal idea has reached such a degree of degeneration, abbreviation, or condensation (these terms are not here intended as descriptive of the actual event) as to make its original sensory content, its elementary tissue, unrecognisable. At this stage the verbal ideas seem to be reduced to a single, unitary, qualitatively undifferentiable type, which has been designated 'imageless.' Unfortunately, the term 'imageless thought' seems to imply either that there are experiences which cannot be looked at from any other point of view than the logical, because these experiences or thoughts have no existence aside from their meaning, or else that these imageless thoughts have a structural character of their own which is neither sensory nor imaginal nor affective.

If the first implication is accepted, then psychology has nothing to do with these experiences; they lie outside the sphere of psychology; they present no psychological problem; they may obey logical laws, but they have no attributes of quality, intensity, duration, etc., corresponding to those of the processes of mind. If the second implication holds (and most of the American upholders of imageless thought seem to favor it), then introspection should be able to reveal the structural character, and language should find a positive name for it that is free from the reference to logical meaning and avoids the nondescript negative 'imageless.' So far the upholders of imageless thought have failed to give us an analytical description, which alone can entitle it to equal rank with the other mental elements. At any rate, our own introspective analyses of suppression clearly demonstrate that there is no new mental process added to the attitude in order to make it mean "must not say so and so."

All that is needed to bring out this meaning is a change from the psychological-descriptive to the logical-indicative point of view. The change is so easily made and in fact is so natural to an unpractised, uncritical observer that the confusion or mixture of *Kundgabe* with description is the rule rather than the exception. Our records furnish many illustrations, especially with C and D. Their earlier introspections are almost entirely *Kundgabe;* gradually more and more descriptive terms are introduced. A and B, on the other hand, begin with minute analyses, and later refer by general, indicative terms to complexes once analysed. Both kinds of report therefore need interpretation, but different kinds of interpretation. With A and B it is merely a matter of substituting complete formulae for short symbols, while with C and D a reconstruction is required, a translation of indicative into descriptive terms, which is rather dangerous as it tempts the interpreter to substitute his own analysis for the observer's words. For this reason the writer has presented the introspections in greater completeness than would have been otherwise necessary, and thus the reader can judge for himself in how far the dangers of interpretation have been avoided.

Apart from the relation of our introspections to meaning and imageless thought, they have established the fact that the suppression, whether as attitude or as idea of instruction, is successful in inhibiting the articulation of the forbidden name, but cannot prevent its appearance in consciousness in one form or another. The reason for this fact will be better

understood after we have considered the introspections on the fore-period, which are summarised and illustrated below.

INTROSPECTIONS ON THE FORE-PERIOD.

Observer A. (35 experiments.)

While listening to the instruction and at the signal "Ready" there is a strong, staring fixation of the small screen where the picture is expected. At the same time such verbal ideas as "What will it be?" occur in the background of consciousness. At "Now" a slight organic excitement sets in with brief suspension of breathing. The speech-organs are now rigidly set for a quick reaction, and the body assumes a general strained position of readiness. Just before the screen is raised there is a flashlike verbal memory of the instruction in abbreviated internal speech, "you are not to name the object." With the first upward movement of the screen there comes a short, slightly pleasant relief from the strains of fixation, the eyes usually following the screen a short way before perceiving the picture. The signals are often followed by auditory after-images.[27]

In later experiments the fixation is less strict, the signals are barely noticed, while the strains of rigidity, frowning, etc., become less intense, and the respiratory irregularity gradually disappears. The instruction is still briefly repeated, but now between the two signals. Everything is much reduced in clearness and intensity.[28]

Finally, fixation is entirely given up. A vague, general kinaesthetic consciousness of the bodily position forms a passive, calm attitude of waiting. The organic elements and repetition of the instruction drop out.[29] The whole period has practically no focus of attention, save that occasionally some auditory element rises momentarily to slightly greater intensity and clearness.

Observer B. (36 experiments.)

At first the signal "Ready" sets up a widespread bodily reaction consisting of changed breathing, slight organic nausea, kinaesthetic strains, and fixation of small screen. There are also auditory-kinaesthetic verbal ideas or internal speech, such as: "wonder whether this will be fore-period or after-period," All this is unpleasantly toned. At "Now" the body becomes rigid and the throat is set for reaction. During this part there occurs sometimes a "vague awareness of the original instruction" or a "general awareness of what to do."[30]

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[27] "Staring fixedly at screen. At 'Ready' heard stopwatch, and was vaguely conscious of some organic complex in connection with breathing. Do not remember hearing 'Now.' Just before raising of screen a vague, verbal memory-idea of instruction 'must not name picture.'"

[28] "Passive, calm attitude of waiting. Slight kinaesthetic strains of readiness. No special fixation. 'You are not to name the object' repeated in internal speech. Then 'Now' and stopwatch heard together, barely noticed."

[29] "Very passive, blank attitude of expectancy. Barely heard signals. Was vaguely conscious of bodily position. No focus of consciousness."

[30] "At 'Ready' fixated center of screen hard. Had vague visual image of some object there. Vague feeling of Aufgabe 'must not name.' Mild excitation with disturbed breathing and a little nausea. Slight strains in head. Rather unpleasant. Then 'Now,' felt body getting rigid, with eyes still fixated on spot."

In later experiments the excitement due to the uncertainty as to which period will have to be reported disappears. The "Ready" signal is now followed by an abbreviated repetition of the instruction in internal speech, and by a vague organic-kinaesthetic attitude with strains in the head and about the eyes, corresponding to the raising of the screen and slight inhibition of breathing. At "Now" there are a slightly increased tension of fixation and a vague realisation of what to do.[81]

Still later the repetition of the instruction becomes vaguer, more abbreviated and automatic.[82] Toward the end of the series it is sometimes entirely omitted. The bodily attitude is now one of calm, passive relaxation with the feeling of security, while fixation remains steady.[83]

Observer C. (46 experiments.)

At the signal "Ready" a strained, organic-kinaesthetic attitude of concentrated expectant attention is taken up and the small screen fixated. Then a part or the whole of the instruction is repeated either auditorily or in internal speech, sometimes interrupted by the signal "Now."[84] Often an auditory after-image of the signal occurs.

This state of consciousness gradually changes into a passive attitude of waiting, with a feeling of ease and fixation of the screen. The repetition of the instruction is now often omitted, and its place is sometimes taken by an automatic-verbal repetition of the signals.[85] In some cases the interval between the signals is described as a conscious blank with no mental processes in the focus of attention.

Observer D. (34 experiments.)

The reading of the instruction has become so tedious and unnecessary that it arouses a strong feeling of impatience, expressing itself in general bodily restlessness, pressing the hands together, drumming on the table, and in verbal comments, as "yes, I know that," "go ahead," etc., carried in auditory-kinaesthetic ideas or in internal speech.[86] The instruction is therefore hardly ever repeated by this observer. The signal "Ready" is interpreted as a question, frequently answered with

[81] "After 'Ready' vague awareness of *Aufgabe* in kinaesthetic and organic sensations. Bodily attitude of tension, strains in head, and inhibited breathing. Kinaesthetic strains in eyes corresponding to the expected raising of the screen."

[82] "Repeated automatically 'you are not to name the object.' Passive attitude, calmly waiting. Feeling of security that I should do the right thing."

[83] "Automatic repeating of word 'Ready.' Fixated the spot where picture would come, waited in relaxed state."

[84] "Strain sensations from sitting up straight in attitude of waiting. At 'Ready' and 'Now' concentrated attention on screen. In auditory terms 'do not name object.' Then saw screen rising."

[85] "Heard 'Ready' again as an auditory after-image. Then a conscious blank. Then 'Now,' and repeated it in auditory verbal terms, until the screen rose."

[86] "Rather impatient. Said 'yes' in internal speech and noticed peculiarity in experimenter's voice. Attitude of expectancy. Was conscious of the pause between 'Now' and rising of screen, with feeling of waiting."

"yes" in internal speech, or with an actual or a "mental nod."[37] This is accompanied by a general kinaesthetic attitude of readiness with strained, expectant attention, and fixation of the screen. The signal "Now" excites a mildly pleasant interest and occasionally gives rise to verbal ideas of comment on the length of the interval between signals, on the experimenter's voice, etc., until the screen is raised.[38]

Toward the end of the whole series verbal ideas seem to be the only prominent items left; everything else seems to drop out entirely or to recede so far into the background of consciousness as to be unnoticed.

In connection with these introspections it is important to recall the exact words of the instruction. "Shortly after you hear the word 'Now' a picture will be exposed in the square opening. You are to speak the first word suggested to you by the object in the picture, unless it is the name of this object. You are not to name the object, but you may describe it or name any of its parts. For example, if it is a cow, you may say small, old, head, etc. After the word is spoken you are to give the results of a careful introspection. Pay particular attention to the processes of suppression and association and to the imagery." It will be seen that this instruction involves four factors which refer to the future: (*a*) it calls for the first word suggested by the picture; (*b*) it requires the avoidance of the name of the object; (*c*) it suggests the use of descriptive terms or the naming of parts; and finally (*d*) it calls for introspections. In the light of Ach's work and the results of the Würzburg school we must assume that these four factors set up four different determining tendencies, which we shall designate as the *a*, *b*, *c*, and *d* tendencies. We need not now make any further assumptions as to their exact nature or their neural substrates, but refer the reader to Titchener's discussion[39] of these tendencies. The *a* tendency, if occurring in isolation from the others, will most naturally resolve itself in giving the name of the object, because under ordinary circumstances this would be the most frequent course of events. At any rate we can safely assume that the name of the picture occurs among those associated processes which are set in some sort of readiness by the *a* tendency. In the case of observers C and D this readi-

[37] "Feeling of impatience. Said 'hurry up' in internal speech. Drew breath and pressed hands together. Then fixated screen."

[38] "At 'Ready' feeling impatient at repetition of instruction. Said 'go ahead' in internal speech. Was conscious of shorter interval between 'Now' and stimulus. Mild interest. Kinaesthetic sensations from fixation of screen and vague general tension of body due to attentive attitude."

[39] Lectures on the Experimental Psychology of the Thought Processes, 1909, pp. 107, 111, 127f., 163, 174, 246f.

ness is sometimes so great as to cast a strong reflex light into the consciousness of the fore period; both observers mention the occurrence of vague ideas that might be used as reaction-words. From the previous discussion it will be remembered that the mid-period of the same two observers was often filled with visual and verbal associations aroused by the picture, and that in their case the attitudinal form of suppression was both less marked and less frequent. Conversely, we find in the fore-period of A and B an attitude remarkably resembling that of the suppression in the mid-period. There are the same organic excitement and irregularity of breathing, the same rigidity of the speech-organs, and the same sort of general bodily strains. The observers do not recognise the similarity at the time of experimentation; nevertheless we believe that these mental processes are a reflex light cast by the *b* tendency into the consciousness of the fore-period, similar to that thrown by the *a* tendency in the case of C and D.

The reasons why A and B should not recognise the similarity are not far to seek. In the first place, during the fore-period there is nothing to be suppressed, or in other words there is a different conscious context. In the mid-period the attitudinal processes occur in the presence of the picture and the idea of (or tendency to say) the forbidden name, while in the fore-period the same processes occur in connection with the sound of the signals, the verbal repetition of the instruction or at least of the signals, and the staring fixation of the small screen. The immediately following movement of the screen and the accompanying temporary relief interrupt these attitudinal processes. In the second place, the simultaneous verbal repetition of the instruction already carries the meaning "must not say it," so that the attitudinal processes in their new context may assume another meaning which prevents their recognition as a suppression. Their meaning during the fore-period may be summarised in the word: expectancy, in accordance with the interpretation explicitly or implicitly put on them in our introspective records.

Nevertheless it is significant that the working out of the *b* tendency as set up by the instruction is at least partially anticipated in the fore-period in both the forms in which it is later to be realised. This need not surprise us, because it lies in the nature of a determining tendency to prepare for future operation all those processes which have any connection with the idea of object, in our case with the idea of the forbidden name. Which of the two forms of suppression will actually occur in the mid-period depends, according to

our results, upon the degree to which the name of the object is present, as is shown in Table II.[40] The figures indicate the frequency with which a certain conscious structure of the forbidden name is suppressed in the ideational or in the attitudinal form or not at all; for example, B suppressed the internal speech of the name four times by the idea of instruction, seven times by the attitude, and twice not at all. In order to change these figures into percentages, add half their value for A, C, and D, and one-fourth for B. It will be seen at a glance that C and D had the largest number of no suppressions, because in their case the *a* and *c* tendencies supplied many associations from which to select a reaction-word. The table also shows that the kinaesthetic tendency and the actual initiation of articulation required in every case the attitudinal form of suppression, while the verbal idea of the name was suppressed merely by the idea of instruction; only when the name occurred in internal speech do we find sometimes the ideational and sometimes the attitudinal suppression.

In his second article[41] on negative instruction Langfeld reports introspections on the fore-period from which he draws

TABLE II. RELATION OF CONSCIOUS STRUCTURE OF FORBIDDEN NAME TO KIND OF SUPPRESSION

Kind of Suppr.	Obs.	Verbal Idea	Internal Speech	Kinaesth. Tendency	Initiated Articulation	No Name
Ideas	A	6	9	—	—	—
	B	13	4	—	—	—
	C	7	7	—	—	—
	D	6	3	—	—	—
	Total	32	23	—	—	—
Attit.	A	—	23	5	2	—
	B	—	7	12	2	—
	C	—	2	4	3	—
	D	—	13	3	—	—
	Total	—	45	24	7	—
No. Ss.	A	7	7	—	—	8
	B	25	2	—	—	15
	C	19	10	—	—	15
	D	18	16	1	2	5
	Total	69	35	1	2	43

[40] The data for this Table are furnished by the experiments of the first series.

[41] Ibid., p. 424.

the following conclusion: "Introspection on the fore-period showed no evidence of the necessity of translating negative into positive instruction. This makes it probable that there is a distinct negative as well as positive attitude, which in most instances can be described solely in terms of cortical set." Our results fully verify this statement, although we should hesitate to use the term "negative attitude," because it might give the misleading impression that the mental processes constituting this attitude can be either positive or negative. It is hardly necessary to point out that the logical meaning or purpose of the attitude may be either positive or negative, while its structural constituents, psychologically considered, can only be either present or absent. The concepts positive and negative are valid for logic, since they refer to the meaning and not to the existence of an experience. In the term "negative instruction" the adjective is not ambiguous because its reference to the meaning of the instruction is evident. In the case of the word attitude, however, the reference is doubtful, because this concept itself has only recently been introduced into psychology as a technical term, and because 'attitude' need not always have a logical meaning.

We can point out only in passing the gradual change in the fore-period due to the frequent repetition of the same situation. Our introspections illustrate in some detail the gradual progress of telescoping or abbreviating a rich or complex and highly organized or differentiated consciousness into a seemingly simple and unitary experience, such as is indicated by the term 'conscious blank.' Some of the original constituents drop out entirely, others become more fleeting and vaporous, some change from a sensational to an imaginal character, all lose in intensity, and the total consciousness falls to lower and lower levels of clearness, until in extreme cases no focal processes remain and we experience a one-level consciousness or the 'conscious blank.' The latter is a rare and extreme event in everyday life, because as a rule novel mental processes rush in and take the opportunity to rise to the focus of attention, that is, to the point of greatest clearness.

INTROSPECTIONS ON THE AFTER-PERIOD.

Observer A. (36 experiments.)

The reaction is sometimes accompanied by a more or less distinct and clear consciousness of the reactor's own voice in kinaesthetic, tactual, and auditory sensations. At other times the reaction is set off so automatically by the previous position of the speech-organs that the ob-

server does not know what he is going to say or that he is speaking. Usually the reaction is accompanied or immediately followed by a feeling of relief made up of decreased strains from fixation or eye-movements, from frowning, and from relaxation of rigidity of the body and the speech-organs, and of organic sensations from resumption of regular breathing, sometimes marked by a faint sigh. This consciousness is quite pleasantly toned.[42] As a rule it is followed by a rush of verbal ideas, especially in the abbreviated sentence-forms, which contain both the name of the picture and the reaction-word just given, as "the kite is in the sky." Often these verbal ideas are of the nature of critical comment on, or justification of, the reaction-word. Now and then the observer asks himself the question: "Why did I say so and so?" These verbal ideas together with an organic attitude of satisfaction constitute a vague reference to the instruction successfully carried out.[43] In a few instances memories of similar pictures, reaction-words, or situations terminate this period.

Observer B. (37 experiments.)

After the reaction a feeling of relief arises due to relaxed fixation, renewed " eye-movements, and change in bodily position or "settling back." Sometimes the reaction-word is automatically repeated in internal speech while the eyes move about. In some cases the reaction-word is different from that intended or anticipated in auditory-verbal ideas and surprises the observer.[44] In such cases the speech-organs are set off either by the fixation of a part of the picture or by some sort of kinaesthetic explosion, rather than by ideational processes. Many other auditory-kinaesthetic processes follow, some expressing wonder why such or such a word occurred, others justifying or criticising it. They are frequently accompanied by a vague feeling of satisfaction and hint at the fulfilled instruction in some indefinite, as yet unalysed way.[45] Further internal speech and sometimes visual-kinaesthetic memories bring this period to a close.

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[42] *Bicycle—Air,* 4.6 sec. "Said 'air' with distinct kinaesthesis of my throat-movements. Did not know what word would come out when I commenced to talk. Felt a pleasant relief in making an ejaculatory sound. Then wondered in abbreviated internal speech why I said air, and further verbal ideas on length of reaction-time."

[43] *Ship—Sky,* 1.9 sec. "I had fixated upper part of picture and now named it automatically. Then eye-movements over the rest of the picture. A sort of vague comfortable attitude of agreement or acceptance, as if justifying my reaction."

[44] *Pear—Stem,* 1 sec. "At 'stem' eyes fixated it. Then auditory-kinaesthetic verbal idea 'you did not name the object.' Feeling of satisfaction that Aufgabe was fulfilled. Eyes began to move away from picture and strains of fixation relaxed."

[45] *Locomotive—Whistle, well, well!* 1.1 sec. "Word 'whistle' came out automatically. Had intended in internal speech to say 'wind.' Was very much surprised at my saying whistle. I had also an auditory image of words wind and smoke as I said whistle. Then realised what I said. Your kinaesthesis gets ahead of the intellect."

[46] *Church—Steeple,* 1.2 sec. "After saying 'steeple' a mild vague feeling of satisfaction that I had done this all right, and had gone through nicely. Attitude of relaxation and mild relief. No particular images."

Observer C. (43 experiments.)

The reaction is usually followed by a kinaesthetic feeling of relief due to the cessation of strains from straight, rigid bodily position and from fixation. Frequently the train of visual and verbal memories started during the mid-period lasts until after the reaction, enhanced by new visual, kinaesthetic, tactual, and auditory images suggested by the reaction- word.[47] Sometimes there is a vague feeling of satisfaction at having obeyed the instruction. Toward the end of the series the reaction-word is occasionally followed by a conscious blank with nothing but the feeling of relief in the background of consciousness.

Observer D. (29 experiments.)

The feeling of relief closely follows the reaction-word, is made up mostly of kinaesthetic sensations due to cessation of previous strains,[48] and is toned slightly pleasantly. The reaction-word itself arouses visual and verbal memories, and sometimes the feeling of satisfaction at having followed the instruction, especially in doubtful or difficult cases.[49] Toward the end of the series the reaction becomes more automatic and the whole period very poor in associational and other contents.[50]

Two significant results are to be derived from these introspections. The first point holds particularly with observers A and B and refers to those instances where the reaction-word is set off kinaesthetically by the locked position in which the speech-organs are found to be, as a result of the previous attitude of suppression. The introspections on the mid-period have shown how the *a* tendency set up by the instruction is prevented from working itself out into a motor reaction if it conflicts with the *b* tendency. As soon, however, as the *b* tendency has realised itself by suppressing the forbidden name, the *a* tendency seems to resume its work by bringing into consciousness other associations set in readiness during the fore-period, and thus it will finally lead to a reaction. Frequently it is aided by the *c* tendency, which may sometimes develop into a habit of naming automatically a part of the picture. In some cases, however, especially when the attitudinal suppression is particularly strong, the inhibitory effect of the *b* tendency seems to extend over all the

[47] *Pear—Leaf*, 3 sec. "Visual image of pear from own tree at home. Kinaesthetic and gustatory sensations of eating one with feeling of grain in it, like goose-flesh."

[48] *Ball—Play*, 1 sec. "Feeling of relief at saying play. Relaxation due to cessation of kinaesthetic effort of mid-period."

[49] *Cow—Milk*, 1 sec. "Kinaesthetic sensations due to closing of eyes as if I had finished my task and deserved a rest. Sigh of relief. Then in internal speech critical analysis of picture, noticed hump on top of head which looks like a hat."

[50] *Pear—Eat*, 1.1 sec. "Pleasant feeling of satisfaction and certainty from kinaesthetic sensations in neck and head due to nod, meaning I had done the right thing."

processes prepared by the other two tendencies, and as a result no ideas rise into consciousness to start a reaction. Under these conditions all the nervous energy seems to become concentrated in the organs of articulation, where it finally accumulates force enough to break through the blockade, and thus to lead to some sort of random movements which finally shape themselves into the pronunciation of an actual reaction-word. The observers A, B, and C describe this state in the following ways, respectively: "made babbling and stumbling articulatory movements before word came"; "your kinaesthesis gets ahead of the intellect"; "groping for a reaction-word, stuttering and keyed up to speak." In the light of our introspections we feel tempted to read a similar occurrence into Langfeld's example *Collar-T-tie*. In our own instances the observers add that they are speaking before knowing what they are going to say, their reactions are forced, involuntary, or unintentional, that is, the word is not anticipated in any conscious form whatever. The beginning of the reaction-word itself seems to indicate that it results from the sudden release or explosion of the restrained speech-organs. The sudden muscular relaxation together with the rush of air from the resumed expiration produce vocal sounds which shape themselves into words, while their initial letters indicate where the suppression had been most intense. If, for example, the attitude of suppression involves the tight closing of the lips, the reaction is apt to begin with labials; if the palate is most involved, the guttural beginning is more liable to occur; if the tongue is pressed against the roof of the mouth or against the front teeth, the words may start with such letters as s, t, th, etc., as in Langfeld's *T-tie*.

The other significant fact brought out by the introspections on the after-period is the frequent occurrence of a pleasant feeling of satisfaction "that the instruction was carried out successfully," "that the reaction-word is all right," etc. This feeling is sometimes accompanied by a train of verbal ideas whose meaning is either a criticism or a justification of the reaction-word with reference to the instruction. In other words, the mental processes of the after-period are still under the influence of the determining tendencies set up by the instruction. Here, however, the influence seems to be mostly physiological, and the reflex light which it throws into the consciousness of the after-period is so dim and ill-defined that a more minute analysis or description under our conditions of experimentation is impossible.

In this connection it may not be out of place to attempt a reconstruction of the physiological or neural mechanism which seems to underlie the two forms of suppression and their resultant association-reactions. This hypothetical reconstruction is purposely couched in the most general terms, because we do not wish to commit ourselves to any histological theory of the nervous system. It seems plausible to assume at the outset that a determining tendency may be set up by an experience if the neural process serving as the substrate of that experience does not conduct all its energy along some definite path, whether intracortical or efferent, but radiates at least a part of its energy diffusely over a larger cortical region. This region is thus thrown into a general but low degree of excitation, sometimes called a "cortical set." We may perhaps think of the diffusion as a storing up of potential energy. Any future stimulus that excites some neural process within this region will find its way prepared, and will therefore require less neural energy to set the process into function. It may also be possible that occasionally the rest of the region contributes its potential energy to the excited process, and thereby enhances the latter's activity or helps it to discharge itself along some new definite neural path.

We assume now that in our experiments the listening to the complex instruction sets up not only one, but several such determining tendencies. The first or *a* tendency, to give the first word suggested by the picture, prepares a cortical set or constellation of neural processes any one of which would issue ultimately in an efferent current leading to the pronunciation of the realised idea. Among these potential neural processes is one corresponding to the name of the object expected. The second or *b* tendency, not to say the name, prepares a cortical constellation which in one respect agrees with the first, namely in as far as it also involves the neural substrate of the name. On the other hand, this *b* tendency, if realised in isolation from the others, would lead to a closing or tightening up of all the muscles involved in articulatory speech. The third or *c* tendency, to describe the object or to name one of its parts, likewise to some extent overlaps the first tendency. If we try to represent this relation by a spatial schema (without assuming, of course, that its cortical parallel is necessarily or mainly spatial) we might think of three circles *K*, *L*, and *M*, arranged so that *K* and *L* cover the same area *x*, while *K* and *M* have in common the area *y*. In the area *x* there occurs the neural process corresponding to the forbidden name. As soon as the stimulus occurs, the neural process common to the first and second tendency is excited, and the forbidden name rises into consciousness and starts two efferent currents, the one in accordance with the *a* tendency to issue in the pronunciation of the word, and the other in accordance with the *b* tendency to prevent articulatory movements. If the two nerve-currents started exactly simultaneously and were of equal strength, no movement of either kind could take place, and we should probably remain unconscious of any tendency to speak or to suppress speaking. We must expect, however, that such a perfect equilibrium, if at all possible, is very exceptional. According to our introspections the *a* tendency seems to have more or less of an advantage over the *b* tendency, at least at the very beginning, and thus it is able partly to realise itself before the *b* tendency becomes effective. While the latter is now spending its energy on the locking of the speech-muscles, the other cortical regions originally aroused by the *a* tendency come into play, probably stimulated by neural processes corresponding to the continuous sight of the picture and perhaps also aided by the *c* tendency, or conversely, until another

neural process has accumulated energy enough to issue in a new efferent current leading to a new reaction-word. Sometimes this second reaction seems for some reason to be delayed, while the energy of the *b* tendency is being used up, and finally can no longer restrain the articulatory muscles from moving. Under the guidance or modifying influence of the belated *a* or *c* tendency the random movements finally issue in the pronunciation of the new reaction-word.

In the case of ideational suppression the neural mechanism seems to be somewhat different. It will be remembered that here the forbidden name arises only either as verbal idea or in internal speech, and very frequently the observers mention explicitly the absence of any tendency to pronounce the word. We must assume, therefore, that the cortical substrate of the ideated name does not issue in an efferent nerve-path, but is conducted into other central nervous processes which as the substrates of the ideated instruction belong to the *b* tendency. From here the nervous energy seems to pass through other intracortical channels, perhaps back into other regions of the *a* tendency, helping the associated ideas suggested by the picture to realise themselves, until one of them can finally lead to a reaction. In order to explain the total absence of conscious suppression, which happened most frequently with observers C and D who reported instead a rich flow of associated ideas, we need only assume that the cortical substrate of the ideated name radiates its energy diffusely over the entire *b* region which is already in a low degree of excitation. The additional energy thus distributed is, however, not sufficient to raise any part of it above the limen of consciousness. In these instances the suppression, to speak with Langfeld, "can be described solely in terms of cortical set." Before leaving this topic we wish to emphasise again the fact that our discussion of the possible neural mechanism underlying the consciousness of suppression is only a hypothetical reconstruction which cannot in any way affect our experimental results.

The two series of experiments with objects were intended to reveal any psychological differences between the effects of a negative and a positive instruction. Objects were chosen for two reasons. In the first place, they introduced into the situation an element of novelty, which was to counteract the progress of abbreviation that in the case of the pictures had advanced so far as to defeat all attempts at further introspective analysis. In the second place, the visual recognition of objects and their subsequent naming are so frequent among our everyday mental events that they likewise are too much of a shorthand affair to promise results helpful to our purpose. Below are given summaries and examples of introspections on the total period, first with negative and then with positive instruction.

INTROSPECTIONS ON TOTAL PERIOD WITH NEGATIVE INSTRUCTION AND OBJECTS.

Observer A.

During the fore-period strong kinaesthetic strains in the raised arm and tensions in the wrist occur in the earlier experiments, while at the same time the auditory perceptions of the signals are very clear.

Breathing is regularly inhibited and arouses a strong organic complex. The eyes are closed and remain so until the experiment is over.

The tactual perceptions beginning the mid-period are very clear, accompanied sometimes by very faint visual images of the parts touched or of the whole object. Recognition always involves the name of the object, mostly in internal speech. Then follows a very complete attitude of suppression, similar in all respects to that experienced with the pictures. Verbal ideas associated with the object lead finally to articulation.[80]

The reaction is usually accompanied or followed by a strong feeling of relief due to decreased strains of frowning and of holding the breath. Sometimes a slight pleasant feeling of satisfaction takes place, made up of a mental nod and verbal ideas of self-justification.

Observer B.

At "Ready" strains in the forearm arise with incipient kinaesthetic sensations of lowering it. Then an unpleasant disturbance of breathing brings with it a faint nausea. At "Now" the lowering of the arm is at first strongly conscious, later it becomes very automatic and is barely noticed.

The object is grasped tightly, furnishing various cutaneous perceptions of its tactual qualities, such as hard, square, smooth, etc., with verbal ideas. Recognition takes place by definite visual imagery of similar objects, often in vivid colors, and the name occurs in auditory imagery and internal speech, without any tendency to pronounce it. Then a vague verbal idea of the positive part of the instruction flashes through consciousness. The hand moves over the object to isolate the parts, visualizing each until the name of one part occurs, usually as auditory image or internal speech, leading to the reaction. Sometimes the name occurs before the part is touched, or a name is rejected with incipient head-shaking and eye-winking.

After the reaction and the accompanying relief there occur many verbal ideas, usually of wonder whether the reaction will be understood as meant, with a clear visualization of the part named.[81] Sometimes a

[80] *Cards—Game,* 2.5 sec. "Fore-period was a more passive waiting. 'Ready' was repeated in verbal idea and also as auditory after-image. Then the verbal idea; 'time between Ready and Now is long.' Finally heard 'Now' clearly. The first touch was very clear, but unsatisfactory, too near the palm. Had verbal ideas: 'smoothness, slipperiness.' Then 'cards' came in internal speech with faint visual memory-image of five-spot, followed by the usual attitude of suppression which finally released itself in 'game' with strong clearness of guttural beginning and an accompanying feeling of relief. Then verbal idea: 'that's a natural association.'"

[81] *Electric bulb—Glass,* 2.2 sec. "At 'Ready' incipient sensations of lowering arm and strain sensations in arm, ready to drop at next signal. Very vague idea of what I was to do. Darkness of closed eyelids, no visual imagery. At 'Now' I lowered arm somewhat automatically, expecting something high. Struck something cool, smooth, and nice, then felt sharp point. Named in kinaesthetic-auditory idea and had visual image of similar bulb. Verbal idea 'must not say that.' Felt over object. Then visual image lighted up as thought reflecting light, word 'light' came as auditory-kinaesthetic idea. Feeling of relief as I began to speak. Had been through quite a strain, with verbal idea 'quite a troublesome one.' Then I remembered that I must tell my story, so commenced."

prominent touch-quality is given as a reaction, and once a visual quality.

Observer C.

The signal "Ready" sets up an attitude of expectation, made up of kinaesthetic and cutaneous imagery of grasping and lifting something. With "Now" the instruction flashes into consciousness for a moment, while the arm-movement is very clear.

The first contact arouses sometimes a feeling of surprise or unfamiliarity and a recognition of various touch-qualities. Afterwards the whole object is recognised, especially as soon as a certain part of it is singled out by touch. Its visual image and its name appear, the latter usually in internal speech. It is suppressed by the idea: "must not say it." Further visual and verbal ideas arise.[82]

One of them leads to the reaction, accompanied by a vague feeling of relief due to the release of the object, with kinaesthetic and tactual sensations, the latter frequently arousing tactual after-images.

Observer D.

In the fore-period the auditory perception of the signals is very distinct. The interval between them is filled by an expectant attitude consisting of muscular strains in lower right arm. The eyes are always closed.

The cutaneous perceptions of the various touch-qualities are sometimes accompanied by a feeling of surprise at the size or shape of the object. The recognition of the whole object involves its visual image and the name in internal speech. But there is never any suppression required, as the object arouses at once further verbal ideas, while the hand is touching the various parts. Sometimes one or another of these verbal ideas is suppressed ideationally, because it had been used too frequently before as a reaction. There is deliberate choice of one of the many verbal ideas in accordance with a self-set task to say the most appropriate word.

The reaction is usually preceded by internal speech and followed by a slight feeling of relief or pleasant satisfaction. Visual memories and verbal comment conclude the after-period.[83]

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[82] *Knife—Cut,* 1.6 sec. "At 'Ready' had sensations of warmth in palm and a sort of stiffness in arm. At 'Now' I had to think quickly what I should do. Then lowered hand, almost immediately recognised object, with visual and verbal image of knife. Repeated knife in internal speech and had trouble in finding a reaction-word. Then I happened to feel the blades and the word 'cut' appeared, first in internal speech, then said aloud."

[83] *Spool—Sew,* 1.2 sec. "After first signal I heard a slight sound and wondered what object it would be. Feeling of interest. Attitude of expectation in muscular sensations due to position of hand in readiness. Conscious of moving hand down. Immediately at touch the word 'spool' came in internal speech with auditory image, even before I had touched all parts. Then felt middle part to make sure and with it the word 'sew' came automatically. Said it with feeling of surety that it was all right. Verbal idea that reaction-time was shorter than usual."

INTROSPECTIONS ON TOTAL PERIOD WITH POSITIVE INSTRUCTION AND OBJECTS.

Observer A.

The fore-period is quickly becoming automatic; its auditory and kinaesthetic contents are less and less clear, until practicallly no focus of attention remains, and a conscious blank results. The lowering of the arm is barely conscious.

The first touch-complex, however, is very clear, mixed with kinaesthesis from moving over the object. If any difficulty in recognition occurs, it is marked by frowning and a faint respiratory disturbance. Sometimes the part most touched arouses a very faint visual image. The recognition of the whole object involves in some cases kinaesthetic images of using the object. Then the verbal idea: "oh yes, it's so and so" occurs and leads at once to articulating the name.[84]

The speaking itself is often conscious as an auditory-kinaesthetic complex with a slight feeling of relief or satisfaction. This is followed by more verbal ideas commenting on the nature of the reaction with reference to the instruction. The tactual release of the object leads to a general attitude of relaxation. In the last experiments of this series the tactual perception of the object is followed at once by a slightly pleasant familiarity-feeling and the reaction.

Observer B.

The fore-period has become very automatic, consisting of vague auditory perceptions of the signals and kinaesthesis of position and movement of the arm.

The first contact is very clear and sometimes slightly surprising. It arouses a visual image of the object, usually at first only vague. While moving over the object the parts touched are visualized more clearly, sometimes in vivid and changing colors. Then the name occurs in auditory-kinaesthetic form, but is not said immediately. There intervenes sometimes a vague idea of the new instruction, and sometimes a period of hesitation or uncertainty. After a renewed contact, in order to make sure, the reaction finally takes place.

Frequently it is accompanied by verbal ideas of wonder whether the name was right or whether a better synonym should have been chosen, or similar self-justification and criticism. A feeling of kinaesthetic relief follows, and in a few cases visual memory-images arise.[85]

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[84] *Clamp—Clamp,* 1.6 sec. "Usual vague fore-period. Recognition of object consisted of pleasant feeling of familiarity, very faint visual image of the object, and clearer kinaesthetic imagery of opening clamp and hanging it on nail. Then came the verbal idea 'clamp' leading to articulation. As I said it had verbal idea: 'I ought to have said paper-clamp.' Then feeling of relaxation in hand and all over body, seemed to come after letting go the object."

[85] *Pencil—Pencil,* 1.9 sec. "Fore-period as usual, very automatic. Then I felt the object carefully, to be able to name the whole object. While touching it had vague visual image of light-grey pencil, which was most distinct where I grasped the object. Then word 'pencil' in auditory-kinaesthetic idea, but did not say it immediately. Was slightly conscious in terms of kinaesthesis in head that I must be sure of object before naming it, therefore hesitated. Had a vague memory of the time when I called a pen a pencil and did not want to make the same mistake. With saying 'pencil' the visual image of it became more distinct."

Observer C.

During the fore-period the instruction is repeated in internal speech, at least in abbreviated form. The arm is lowered automatically at "Now."

Then follow the touch-complexes of the parts successively touched, with recognition of the material, size, etc. As soon as a special part is felt the whole object is recognised and visualised. This leads immediately to the name of the object, at first in internal speech, then as reaction.

The latter is often very automatic and accompanied by visual imagery of similar objects. Tactual after-images occur after releasing the object."[86]

Observer D.

During the fore-period the instruction is repeated at first in internal speech and very completely. Later it becomes more abbreviated and finally is accepted with verbal idea: "yes, sir, I know that," etc. Afterwards it drops out entirely. The arm is lowered almost unconsciously.

The first cutaneous perceptions are very clear and sometimes named in verbal ideas. The recognition of the object occurs with a distinct visual image and the name in internal speech, which, however, is later omitted, so that the reaction occurs immediately. Sometimes wrong recognitions and wrong names occur first, but are inhibited until renewed touch and movements lead to the right name, which is usually due to the contact with a special part of the object.

The reaction is followed by slight feelings of certainty, doubt, etc., and sometimes by new visual and verbal memories."[87]

Before taking up the comparison of the negative with the positive instruction it is necessary to consider the changes introduced into consciousness by the use of objects instead of pictures. The only important difference seems to take place in the stage of recognition. The pictures used in our experiments are so small that the eye can take in the whole object at a single glance and recognise it immediately. The objects, however, are of different sizes, so that one grasp by the hand reveals as a rule only a part of the object. In the course of making several successive grasps, or of moving the fingers over the object, certain parts are sometimes recognised

[86] *Rubber-stamp—Stamp*, 3.3 sec. "After 'Ready' repeated directions in internal speech. First contact was roughness of small disc. Feeling of unfamiliarity. Ran fingers over it until I came to handle. Recognised it at once, visual image of stamp with rubber-handle and nickel-plated rubber-holder. Then word 'stamp' was spoken automatically. Next I had visual image of stamped paper and several tactual after-images."

[87] *Nail-file—File*, 2.3 sec. "Fore-period as usual. Cutaneous perceptions of cold metal and pointed rough end. Grasped handle first and was uncertain until I touched file-part. Visual image of silver nail-file with steel end and dull point. Then a clear image of some design on the handle. Said 'file' automaticallly, without internal speech. Had feeling of certainty that I was correct."

and named independently in verbal ideas, before the whole object as such is known, as in the case of the handle of the screw-driver. Frequently the recognition of the object depends upon contact with a special part; thus, several observers recognised the electric bulb as soon as they touched its sharp point. In most cases the first few contacts furnish only isolated perceptions of touch-qualities, of form, size, weight, material, etc. The final recognition of the whole object is usually made up, asode from the cutaneous complexes, of clear visual images, often in vivid colors, of similar objects (except with A, who is a poor visualizer), of the name of the object in verbal idea or internal speech, and of a more or less pleasant feeling of familiarity. As in the case of the pictures the recognition is followed by the stages of suppression and of search (except with D, for the same reason as in the experiments with pictures), which in their mental structure are like the corresponding stages of the earlier experiments. There is likewise no important change in the fore and after period. It is evident, then, that the experiments with objects and negative instruction confirm in every way the results obtained with the visual stimuli.

In one respect this similarity is somewhat surprising. We must remember that the instruction calls for the first word suggested by the object. One should expect, then, that the very touch-perceptions would lead to immediate reactions. Instead, the observers in every case wait for the recognition of the whole object, which is not required or even suggested by the instruction, and which besides is unnecessary, as unrecognised pictures or objects ordinarily may lead to reactions. There seem to be two possible explanations. On the one hand, we may refer to the racial predisposition or instinctive *Einstellung* to cognise everything,[58] which may make itself more strongly felt in unusual situations where the sense of sight is excluded. If such a general racial predisposition exists, we must assume it also to function in the experiments with the pictures. Indeed, here it may superpose itself upon the particular tendency to name the pictures, and may thus give this *a* tendency the initial slight advantage which our introspections lead us to attribute to it. On the other hand, we have reason to believe that the *a* tendency, to name the first word suggested by the object, is far less strong than the *b* tendency, except with regard to the forbidden name which is set in neural readiness by both of them together, although

[58] Titchener, Lectures on Thought-Processes, pp. 124 and 250.

perhaps more by the *b* tendency than by the *a* tendency. As long, therefore, as the tendency to suppress is stronger than any other tendency, the former must necessarily bring the forbidden name to consciousness. That is to say, the mental processes constituting the attitude or the idea of suppression, and meaning: "must not say it," presuppose the conscious existence of the experience to be suppressed, or in everyday language: we must know what to suppress, and we can neither know nor suppress it if it is not in consciousness. It may be true, as Freud's theory seems to maintain, that both act and object of suppression under certain abnormal conditions become unconscious, that is, function neurally only; but the present experiments furnish no evidence for this position, perhaps because the required abnormal conditions were not realised; neither did the writer, in his introspective analysis of the 'concealed complex,' find any support for it.[59] A comparison of the consciousness under negative instruction with the consciousness of the hidden complex is reserved for a future occasion. In the meanwhile the writer, who is at present unable to continue the study of these topics, may be permitted to suggest here the problems of analysing the consciousness of negative judgments and negative suggestions.

A glance at the introspections with positive instruction reveals at once the much greater poverty in mental contents and much quicker automatization of the whole consciousness. In the fore-period the new instruction is repeated a few times in the earlier experiments by C and D, never by A and B, although with B a verbal memory of it occurs occasionally in the mid-period, when recognition is difficult. In the case of A, B, and D, such difficulties are not rare and lead to an attitude of exaggerated caution in reacting, which shows itself in longer reaction-times. This result seems to be purely accidental, and is due to partly or totally unsuccessful recognitions. With C tactual recognition seems to be rather easy and quick, although even here a few difficult cases increase the range and mean variation of the reaction-times, while their average length, which otherwise would have been less, is thus made equal to that of the previous series. Aside from the accidental attitude of caution the mid-periods differ from those with negative instruction in the obvious absence of the

[59] A preliminary Introspective Study of the Association-Reaction Consciousness. *Am. Jour. Psychol.*, XXI, 1910, 597-602.

stages of suppression and hesitation, while the after-periods of the two series are very much alike.

Following out our previous hypothesis, we must now assume that the positive instruction sets up a determining tendency to say the name of the object. Langfeld seems to think that it also sets up determining tendencies not to say anything else. He writes: "in all positive attitudes one can say that there is also a negative quality, inasmuch as the way is blocked for all associations not included in the instructions." Now the term 'negative quality' in this connection is ambiguous; and the statement seems to us to be based on logical argument rather than on psychological evidence. Logically, to be sure, any x implies a not-x; but the logical implication is valid whether it is ever experienced in an individual consciousness or not. As soon, however, as it is thus experienced, x and not-x become at once psychological existences or mental processes. But the reverse need not necessarily be true, that is, the mere experience of x need not involve either the presence or the suppression, even the subconscious suppression, of the not-x. Our new instruction: "do not react with anything except the name of the object" is as favorable to the formation of such a tendency to suppress other ideas as it can be made in combination with a positive instruction. Nevertheless our introspections do not furnish the slightest evidence of a conscious or unconscious blocking of undesired associations. They lead us, therefore, to the conclusion that the only difference in consciousness under a positive and under a negative instruction is the absence or presence of the stage of suppression in either of its two forms. They also seem to support the view that a simple positive instruction sets up only one determining tendency, in accordance with which certain mental processes are neurally prepared for easier and quicker entry into consciousness as soon as the proper stimulus occurs; while a negative instruction sets up at least two determining tendencies, which either bring about a more or less conscious conflict of two mutually exclusive motor reactions, as in the attitudinal form of suppression, or prevent their ideational representations from issuing in motor discharge, and thus allow another neurally prepared process to lead to a reaction, as occurs in the ideational form of suppression.

In conclusion the writer regrets that lack of time and library facilities prevent his discussion of the recent literature pertaining to this subject.

THE THEORY AND LIMITATIONS OF INTROSPECTION

By Raymond Dodge, Wesleyan University

I suppose that no reputable scientist would venture to publish any considerable alleged discovery in the physical sciences without a careful investigation of his instruments under the precise conditions under which they were used. His statement of instrumental variability, latency, and constant errors would constitute data for a scientific evaluation both of his technique and of his experimental results.

In some directions at least, psychology has been as conscientious in matters of technique as any of the biological sciences. In the investigations of sense perception, for example, of memory, reaction, and the Weber-Fechner law, it has criticized its technique and calibrated its instruments, not infrequently with tedious attention to details.

In view of such evidences of scientific conscience will it not seem all the more surprising to the future historian of science that psychology still uses its most fundamental instrument with a jealous, insistent confidence in its universal applicability and adequacy which approaches dogmatism?

To be sure psychology has not been without its chastening experiences. Theoretical discussions are not wanting from Comte to Möbius which point out the fallaciousness of all introspection and the consequent "hopelessness of all empirical psychology." In a more hopeful, and probably also in a more scientific spirit, specific errors and sources of error have been pointed out, and concrete rules for introspection have been formulated. But, in by far the largest number of introspective investigations, all account of the theoretical applicability and consequent limitations of introspection with respect to the problem at hand is conspicuously lacking. The most notable recent exception to this rule with which I am acquainted, is the recent Ergänzungsband of the Zeitschrift by Müller.[1] In contrast to this model of critical introspective technique, some of the studies in which introspection has been

[1] *Zeitschrift für Psychologie. Ergänzungsband* V, 1911.

pushed farthest seem to approach the limit of uncritical procedure.

Undoubtedly, a complete systematic investigation of the relative reliability of introspection in the various lines of psychological investigation would be difficult. Perhaps it would be impossible. In general, I suppose that the reliability of any one method must be expressed in terms of another. Mere variability is not conclusive unless we have some means of proving that the phenomena themselves are really invariants. Introspection has the peculiar fortune or misfortune that the precise phenomena which it mediates are given in no other way.

Even if a test of relative reliability were possible, it might well be questioned what is the use of trying to measure the value of the only available method. If we are utterly dependent on it why not simply accept it? The objection is not entirely imaginary. It represents a traditional attitude.

The question of possibility can only be answered by the attempt. If the thing is worth while let us go as far as we can.

To the question whether it is worth while my answer seems obvious enough. If there is any way of estimating the probable error of introspection under various conditions, or any way of discovering its theoretical limitations, two real scientific advances will have been made; we shall have some measure of the relative certainty and finality of alleged introspective facts, and we shall have the stimulus that comes with a consciousness of our limitations.

The occasional fallibility of introspection is no new heresy. Concrete contradictions in the introspections of different observers, the limitations of individualism and the impossibility of subjecting the facts of introspection to mathematical formulation in any other way, led to the adoption of experimental conditions. This was the guiding principle of the "new psychology." Psychology has indeed changed both in content and in method since the days of its complete bondage to philosophy. I believe it still promises growth.

Gradually increasing knowledge of the anatomy and physiology of the nervous system, and of the interdependence between neuroses and psychoses, forced psychology into a quasi-alliance with physiology. Up to the present time however, it is conspicuous that the two books—physiology of the nervous system on the one hand, and analytical psychology on the other—have but scant relationship. The splendid illustrations of histological preparations to which the novice

must still accustom himself in psychological text-books function chiefly by their impressiveness. Nervous anatomy and physiology have raised more questions in psychology than they have answered. But persistent inquiry into the physiological conditions of consciousness is conspicuously lacking. On the basis of a postulated parallelism, psychologists have chiefly been content to state the facts in both series, confuse the terminology a little, and leave the detailed correlation to the uncontrolled imagination.

Recent rapid growth of exact information in allied fields of medicine and general physiology finds even less place for itself in orthodox introspective psychology. Though for some of us, it stimulates a persistent belief in the possibility of coördination and unification.

But it is the lack of unity and scientific coherence in the stuff of contemporary psychology, the growing gaps between the different lines of investigation, and the inhospitality of introspective psychology to non-introspective facts however closely related, that raise the methodological question. They emphasize the need of every growing science that, from time to time, it give its postulates and its methods careful scrutiny. If introspective facts are the only mental reality, then our course is clear and relatively simple. If, on the other hand, there are any other real indicators of the mental life, then, in my opinion, we not only miss our opportunities when we refuse to use them, but we make ourselves ridiculous by our inability to emancipate ourselves from philosophical tradition.

After all then, it is the professed dogmatic intolerance of introspective psychology that forced me to methodological discussion. In spite of many vigorous protests, it still seems orthodox to regard introspection as the only true psychological method, equally adequate for every psychological inquiry. In spite of the long list of those who have contended for the possibility of unconscious mental reality, our dominating tradition is the dualistic dogma that that alone is mental reality which is given in introspection. All other facts, however closely related, are physical or physiological. Psychologists as far removed from each other as Lipps and Titchener agree in the fundamental assumption that non-introspective facts are non-psychological. Even when as in some recent text-books behavior is recognized and even emphasized in psychological method, its function still seems to be to indicate the existence of introspectively discoverable facts.

In this view of the case, the direct experimental formulation of a problem of mental organization, like mental fatigue,

as a problem of organic life is a methodological absurdity. The only legitimated functions of experiment are either to provide suitable conditions for introspection, or objectively to lead to the presumption that adequate introspection of the subject would reveal something. Failure to introspect condemns an investigation to the outer darkness of physiology. Facts of nervous action may be interesting or even suggestive but "psychology better take them from the physiologist." In public conference not long ago it was seriously questioned whether titles in nervous anatomy and physiology couldn't well be omitted from the Psychological Index.

Against this dogmatic dualism of science it is the business of this paper to make earnest protest. One may have patience with parallelism as a working hypothesis even though one believes it to be both useless and misleading. But when the working hypothesis disguise really covers a dogmatic ontology, then it ceases to be scientific or even honest.

It may be that after all it were better to surrender the name psychology to those who believe that it applies only to a description of the findings of introspective consciousness. If so then let us candidly confess allegiance to another science —a science of the conditions of human experience, conduct and personality. It will be a true science in that it will investigate the totality of the conditions of the phenomena with which it deals. Rather than haggle about its source, it will welcome every real indicator. Every fact that may throw light on conduct, experience, or personality whether from pathology, neurology, introspection, or the behavior of animals will find itself at home, not merely a stranger's welcome.

Personally I believe that the proper name for such a science is psychology, the science of the highest principle of organization of human life. A name which only comparatively recently in the history of science has been appropriated for a small group of important relevant facts which sadly needed straightening out and systematizing, but which of themselves neither constituted a science, nor found any need of a soul. It is difficult to see why they insist on the name.

It is my belief that an adequate critique of the theory of introspection will show that non-introspective evidence is not only legitimate in certain directions; but that, if obvious limitations of introspection are to be transcended, it is a necessary complement to introspection. It will be a later task to show that such relevant evidence exists in connection with mental work and mental fatigue.

The Problems of Introspection

Notwithstanding the arraignment of Comte, there is no serious inclination among contemporary scientists, as far as I know, to deny the possibility of introspection. Apparently each of us is aware in a very direct and convincing way of sequences and coexistences of mental facts, and of certain differences and similarities between them. Probably most psychologists would go further. With the aid of experiment, the rise and development of a conscious fact may be said to be an *observable* experience. It is just as real and just as truly observable as the development of an embryo. Observation interferes with one no more than it does with the other.

Furthermore there is no real difference among psychologists concerning the importance of introspection. The reality of introspection and its "radical" importance in any science of human experience are indisputable.

But introspection is not only a method of psychological investigation, it is also a mental fact, and as such it must be capable of psychological analysis and investigation.

Quite apart, then, from epistemological questions, which can only confuse the issue, the fundamental psychological problem with respect to introspection is to understand it as a mental fact.

The second problem is; how far into the nature of the various other mental processes can such an instrument be expected to penetrate?

A third problem will as a matter of fact eventually grow out of our answer to the second, viz., the old problem of supplementing introspective experience where its data are not unimpeachable, or where it raises questions that it cannot directly answer.

Theory of Introspection

There seem to be two main types of tradition with respect to introspection. The oldest and most widely held is dogmatic introspective realism. Beginning early in ancient philosophy it served as postulate equally for the most various pre-Kantian philosophies. The Cartesians, the English Empiricists and the Continental Sensationalists, however they differed with respect to the origin and validity of our knowledge of an external world, and however divergent their deductions, all agreed that knowledge of our own mental life was immediate and adequate. To think and to be aware that we think was one and the same process. The existence

of any real mental fact which was not evident in selfconsciousness was consequently inconceivable. If, as thinking substance, we do not know how we move our arm, it follows self-evidently for Geulincx that some other being must do it for us. The act is none of ours.

Across the channel the principle led to the denial of innate principles. Its logical conclusion was the denial of soul itself. We never come upon it in our most exhaustive introspections.

Only when the problem of the gap between the knower and the known became an inner problem of the monad do we find a toleration of non-introspectable mental facts. For the monad, whose being consists in perception, the failure to realize that it is perceiving must be explained by some difference in its perceptions. But it was in conjunction with this admission of imperceptible perceptions that introspective realism reached its highest pre-Kantian formulation. For Leibnitz all reality is fundamentally of the same kind that is given to us directly in introspection.

First in Tetens and Kant do we find a clear consciousness that the inner perception like the outer gives us only phenomena. But introspective realism persisted in post-Kantian philosophy. And in spite of a habit of speech by which most of us as a matter of course speak of mental phenomena,[2] introspective realism is still dominant in modern psychology.

Now for the thoroughgoing introspective realists, I suppose that there is no introspective problem at all. They are immediately aware each of his own mental world. What each knows of himself is ultimate reality, since in his particular case, knowing and known are identical and identity leaves no room for discrepancies. To be sure the inter-subjective discrepancies in alleged introspective facts, the gradual growth of an introspective technique, and the obvious epistemological difficulties in substituting feeling or willing for knowing in the identical proposition, might well arouse the realist's suspicions. But it is simpler to regard the discrepancies as accidents, or to limit mentality to the intellect. Unfortunately realism and phenomenalism seem to be subject to the physiological "all or none law."

But it was in the critical discussions of introspective phenomenalism that there arose a new and insistent problem, the psychological problem of the inner sense, viz., How does mind perceive itself?

The various physical stimuli and the peculiarities of the

[2] BRENTANO, Psychologie p. 10 fol. defends the use of the terms mental phenomena entirely without metaphysical implications.

different sense organs seemed to account for the qualitative differences in sensation. The elaboration of the sense material into experience depended on central conditions, sense forms, the categories, and in general the organized residua of past experience.

For the inner sense on the contrary there was no obvious sense mechanism. No inner eye explored the inner horizon. No inner touch brought them in contact with themselves.

Within the Aristotelian tradition that sensation is a being moved, a being impressed, a vis passiva, the introspective problem naturally took the form: How can mind impress itself? How can it be at once mover and moved? impressor and impressed, active and passive? The simplest answer was negative. But to say it can't is to ignore the facts. We can and do introspect.

One may point out in passing, that an inner sensory mechanism would not be very valuable if we had it. If the miracle of transforming physical energy into consciousness has once taken place, there would be no function for an inner sense mechanism. There would be nothing to transform. It would be of no special service to the physiologist since his problems need finer tools than any organs we would likely be endowed with. In practical life on the other hand, it would be a distinct disadvantage. Additional facilities in introspection would doubtless as Kant suggests turn humanity into a race of hypochondriacs. There are enough tendencies in that direction as it is.

I suppose it is to Leibnitz on the Continent and to Berkeley in England that we really owe the modern protest against the passivity of perception. The monads have no windows. Visual facts are only signs for the perception of space. But in our more immediate psychological tradition, it was the Herbartian doctrine of apperception which, in spite of its unsatisfactory assumption of energizing ideas, first put the theory of perception on a permanent basis.

It is now pretty generally accepted that, however we may view the abstract sensation, every complete process of perception is an active process. Perception always involves factors from past experience. Systems of organized residua, the apperceptive masses of Herbartian terminology, are the conspicuous conditions of a unified experience. They emphasize, modify, complete, distort and select from possible sense material.

Every adequate sense stimulation arouses these residua of past experience. It fuses with some into the percept.

It associates itself with others in various systematic ways so that every percept comes to consciousness in a complex setting —as a member of temporal, spatial, causal, and meaning systems. If the stimulation occurs in sleep and arouses no residua of past experience there is no consciousness at all.

Now while the inner sense lacks every vestige of a sense organ, the apperceptive elaboration represents a side of the perceptive process that is available for the inner sense as well as for the outer. In introspection to be sure the apperceptive systems are peculiarly selected. But if the proper apperceptive systems are granted, it is obviously as easy to integrate a fact of consciousness with other similar facts into an inner experience as to integrate it with motor and sensory factors into spatial position and causal relationships. The differentia of a physical fact is its objectification in a world of extended things. This has found various expression. As the Cartesians put it, the essence of body is extension. As Kant expressed it, the form of the external sense is space. The differentia of the facts of psychology is that they are regarded as "having place in or being part of some one's consciousness or experience."[3]

That is they differ from the physical facts entirely in their noetic setting, not in the stuff.

That this is a valid account of the process of introspection may appear from a description of a concrete instance. If I have a given percept say a vase, perception itself places it directly in spatial relationships with an external world of things. I perceive it at such a distance, of such a shape, and size, beautiful or ugly. More remotely it is known as new or familiar, as having a certain function, and value, as having certain physical and chemical properties, etc. When these various classifications are complete I shall have apprehended the vase in all its objective relationships as a part of my objectified experience of a world of things. But any part of the above processes may also be the object of introspection. The process I would apprehend introspectively doesn't change; that is, under the simplest ideal conditions it doesn't. What do change are the apperceiving noetic systems. They no longer relate to position, size, use, and history, but to the inner complication and sequence of experience. Since the object in the two series may remain identical the difference between psychology and physics is not a different stuff, but a different group of relationships.

[3] WARD, Enclycopaedia Britannica, Ed. 11.

To be sure the stuff may also change but differences of stuff are not necessary.

Brentano insists that the object of psychology is presentation as process, while the object of physics is the presentation result. If we attempt to reduce this difference to psychological terms it seems doubtful if we can distinguish directly between the idea as process and the idea as result in any other way than the one I have pointed out.

In an analogous way observation of the same identical physical fact, for example the fall of an apple, yields data for the various scientific disciplines according to the various systematic groupings of experience with which it happens to integrate. If it integrates with any of the systematic groupings of experience itself, it yields data for a science of experience as such.

Use of the term self-perception is misleading if it suggests any necessarily peculiar object of regard that may be perceived only by an internal sense, or if it suggests a division of the self into observed and observing, different from that which occurs in every moment of attentive observation.

Neither the stuff of introspection nor its methods are unique. The differentia of a science of experience is that as a group of organized experience the lines of similarity and difference along which the organization is effected involve an abstraction from the spatial attributes of experience.

An experimental test of the validity of this account of introspection seems to be impossible. If the theory is true every attempted experimental test of it would involve predetermined apperceptive factors, which would approximately correspond with the sum total of the experimenter's past experience and philosophic prejudices concerning the matter. As an experiment in introspection it would prove nothing except the experimenter's attitude to the problem.

If this psychological account is true, however, the history of introspective psychology should furnish evidence at every step that the introspective process was determined by the available apperceptive systems. It should show this both in the development of the individual psychologist and in the development of introspective schools or fashions.

The training of an introspective psychologist seems to be no less exacting than the training of an observer in natural history. Neither is born ready-made. Both require a certain amount of practice. Both observe better the more complete

their information is about what they are to observe. The fundamental rules to avoid prejudice, inference, and the infusion of affection are alike for both. Even though his material is supposed to be given to him directly, a beginner's observations in psychology are as useless as in histology.

He observes what he is acquainted with or thinks that he is acquainted with. Most of it is trivial. The really important matters he overlooks until his attention is called to them; i.e., until he has developed adequate apperceptive systems.

Even the trained introspectionists are liable to error. Few psychologists now-a-days are content with analyses "am grünen Tisch." Lipp's "pure" psychological experiments are commonly only the preliminaries for carefully planned experimental modifications of the determinable conditions. Every trained psychologist is aware of the insidious outcrops of expectation and interest, of the effects of suggestion and leading question, of the tendency to find what the instructor or the theory demands. At least in our pupils we are aware of all these things. The history of psychology shows that they are universal.

Just now we are struggling with an illuminating question in the problem of imageless thought. More than once it has been pointed out that the individual's answer to the question depends largely on the school in which he was trained; i.e., on the categories and schemes with which he happens to be equipped. Imageless thinkers, on the other hand, find considerable difficulty in naming their categories and in describing their experiences in positive terms without reference to sense imagery. If they really do find imageless experience, most of us clearly lack the appropriate apperceptive systems. At the heart of the matter I believe the real problem is not whether a given observer always finds sensory factors in the analysis of all his mental experience, but how any observer with the usual training could avoid finding them, whether they were necessary parts of that experience or not.

The facts can doubtless be seen with less emotional disturbance in temporal perspective. But enough, the history of psychology shows exactly the same dependence of observation on its apperceptive systems that is seen in the natural sciences or in practical affairs. I fear I have been guilty of proving the obvious. But if so there is all the less reason for us to hesitate in the conclusions.

The Limitations of Introspection

An adequate theory of introspection should furnish a unifying principle of those empirical rules by which the more conscientious introspectionists have governed their practice. It should also indicate the origin of those disturbing individual differences in introspection that more than any other one factor prevent us from speaking of a science of introspective psychology.

Both of these deductions from our theory of introspection are eminently practicable if this were the proper occasion for them. What is more to our present purpose, an adequate theory of introspection should also enable us to estimate the kind and amount of information that may be expected from it. This was our second problem. Let me put the main issues concisely in the form of hypothetical questions.

If for the sake of argument consciousness should be supposed to be a kind of organization of what is otherwise nonconscious except in its potentialities, could introspection as we have learned to know it ever give us directly either the unorganized elements or the process of their organization? Would not inquiry concerning these facts, however, be both a legitimate and a necessary part of any science of such organic life?

If mental life should for the sake of argument be supposed to be extremely complex, so that each moment of consciousness involved n factors in various grades of clearness, would any more of the total complex be directly observable by introspection than could in turn be cleared in consciousness through the arousal of appropriate apperceptive systems for the successive integration of the complex, part by part?

Conversely, if introspection at any moment found only one, or relatively few, or only one kind of elements in consciousness, would that constitute evidence that the actual facts of mental life were simple, or might it not be that internal vision was limited by the limitations of our instrument?

If consciousness itself, for the sake of argument, should be regarded as a process of integration, could the process itself ever get integrated in terms of its resultants? Would not an introspective psychology forever be doomed to blindness with respect to the dynamic reality?

Perhaps all of the hypothetical antecedents are contrary to fact. That is beside the point. They are all possible as far at least as any legitimate scientific presupposition is concerned. No scientific method has the right to start arbitrarily with

the assumption that they are all wrong. Their truth or falsehood must be regarded as a matter of fact. Our conviction should not be based on philosophical prejudice but on whatever evidence we can obtain.

Some of the limitations of introspection as a tool for investigating the mental life are finding ample confirmation in the disclosures of those apparently large and relatively important fields of the "sub-conscious." Many of us dislike the term with cause. It seems to stand for a mass of unscientific speculation. At best it says too much. Personally, I prefer the word "uncleared"[4]—which merely states the facts and leaves the implications for science and not for speculation. "Uncleared" mental facts may be conscious or sub-conscious or unconscious. Their generic characteristic is that in some way or other they fail of having been taken up in the introspective integration. Some of the facts that are uncleared in one moment of consciousness become cleared in the next. Some of them have waited long for adequate integrative systems. Some are perhaps by their very nature eternally condemned to obscurity. The dependence of the clearing process on the available integrative systems emphasizes the value of direct experiment, of the unusual, the exaggerated, and the striking. Even the purely physiological and the pathological may indicate new lines of cleavage.

Even under the most favorable circumstances it would seem to be theoretically impossible for introspection to disclose the elements of consciousness. The current doctrine of sensation might seem to disprove this. But sensations as introspective psychical elements are rank pretenders. A simple sensation is of course utterly undiscoverable by any process of introspection. Certain abstract qualities of consciousness, as we know it in introspection, have in the course of scientific progress become hypostatized and unified as sensations. But when it is held that the attributes of sensation include quality, duration, extensity, and intensity; and I would add consciousness of their reality as part of personal experience, with an indefinite number of relationships to the rest of experience—it seems absurd to regard the observable sensations as elemental.

On the contrary, the real elements, in the sense of the stuff of which consciousness is composed, must forever be in-

[4] An Experimental Study of Visual Fixation, Chaps, II and III, *Psy. Rev. Monographs, No.* 35.

accessible to introspection, since in introspection we can only find completed consciousness.

This may not seem very serious, but it forces the question: If we would discover the stuff out of which consciousness is made, where will we seek it? Perhaps we may come closer to it in the physico-chemical constructs of biology than in the sensations of psychology. At least the former have as much claim to our attention as any introspective fact.

Furthermore, introspection seems incapable of disclosing the apperceptive masses on which any given moment of awareness depends. One or two aspects it may pick up and bring to the focus of consciousness. A few may in turn be apperceived, but the great bulk must remain forever uncleared.

We can never hope that the conditions of consciousness will be disclosed in consciousness. C. in moment 2 may discover some of the conditions of C. in moment 1. But that will be by retrospective analysis and inference and not because C. in any moment perceived its conditions.

Introspection has never been able to fill out the causal relations of any fact of consciousness, or to complete a statement of its conditions. The rise of an idea is always something of a miracle. After it has come we can find some premonitions of it in antecedent consciousness. But the same discoverable antecedents may to-morrow give rise to a totally different effect. How any particular concept was synthesized we cannot tell by introspection. We have never discovered the welding process. We have never traced the steps of manufacture. The feeling of inspiration that commonly accompanies ideas of sufficient impressiveness seems to be a phenomenal correlate of the hiatus of introspection.

Finally the psychical dispositions, psychophysical or physiological residua, engrams, or whatever we may for convenience call them, are never directly accessible. Only by construction do we know any thing at all of residua. Yet even the most ardent introspectionist would hardly deny that our knowledge of memory and the rate of forgetting belongs to psychology.

But perhaps it will be claimed that all the inaccessible depths of the uncleared are of the same nature as the accessible, just deeper water that our sounding lines will not quite reach. I believe that the evidence is against it: The subconscious, the elements of consciousness, the processes of their integration, and the residua of past experience differ from consciousness in one very significant fact that they are

not describable in terms of introspective categories, except negatively. As far as I can see there is no reason to suppose that a scientific construct in psychology will be any more like the facts of simple observation than the scientific constructs in physics are like the simple facts of observation. I can see no reason for believing that introspection guarantees any closer approximation to the concept that embodies the summary of all the available indicators than does sense perception.

Finally, self observation, as a means of analysis of consciousness, or as the basis of a description of the complex whole, regularly and inevitably contaminates the results. More than once in the history of chemistry, supposed traces of various elements have been reduced to ingredients of the vessels used. Modern chemistry makes an entirely justifiable demand that every analysis must rigidly exclude the possibility of introducing its findings in its technique.

Now unfortunately in introspection the instrument may contain everything that can appear in the analysis. Nay more, it must contain everything that the analysis can discover. If a factor is expected, it is ipso facto in consciousness. No amount of scientific caution can separate entirely the observed fact from its apperceptive masses. Even if one conjectures that a factor will not appear, its subsequent appearance will not be entirely free from the possibility of error. To have been considered at all is to have been in consciousness and consequently easily revivable. The difficulty is inherent in the psychology of observation. Good observers must be trained—trained to look for certain specific things. Psychological observation offers no exception to the rule. No psychological scheme has been too absurd to be supported by introspection. It shows fashions like hysteria and the delusions of the insane. Even the fundamental categories of consciousness change with the years, while new and previously totally unsuspected facts may be readily introspected as soon as there is theoretical ground for belief that they exist.

On these considerations the methodological dogma that all mental reality is subjectively observable and conversely that the subjectively observable alone is mental reality seems to me utterly unjustifiable. Moreover, analogy of the successful empirical sciences is opposed to it.

To be sure, as Titchener insists, every natural science picks out some specific group of phenomena for investigation. Let us take sound for example. Within the limits of direct obser-

vation physics describes the phenomena of sound. But what would be our science of sound if we expurgated everything that wasn't directly an auditory experience? Sound waves for example are never directly observable. But how absurd it would be to insist that they are metaphysical or non-physical because they are not a direct part of that group of phenomena with which acoustics deals. To be sure we have no sense organs fitted for their perception. But experiments are readily devised to demonstrate their existence. The experiment doesn't make them audible otherwise than as sound. It doesn't even make them feelable or visible. It adjusts its technique so that visible and feelable facts shall become reliable indicators not only of the existence but of the character of the reality that we can never hope to know directly except as sound. It is a wonder the metaphysician never hit on the expedient of a visual-auditory parallelism. He probably would if physics had allowed itself to be invaded by the high a priori road as psychology has been.

It may be objected that the only reality in acoustics is sound and that the rythmic displacement of visible particles isn't sound at all. The only possible answer is affirmative. But we must go one step farther and assert that in the scientific effort to apprehend reality all real indicators are significant. The direct sensory facts have no peculiar claim even in physics. Is the mechanism of the inner sense so much more reliable and adequate than that of the outer senses that it alone gives us things as they are, or spares us the necessity of scientific construction?

If in practice or in fatigue experiments, certain mental processes are found to be correlated, I believe that is as valid an indication of mental fact as the most elaborately controlled introspection. If there is experimental evidence that certain mental capacities suffer measurable objective change, I believe that is just as truly a psychological fact as anything that is discovered by introspection. Indeed, in this case at least, the objective method will be far more reliable.

The danger of this position is that it seems to open the door for that kind of metaphysical constructions that psychology has been centuries in freeing itself from. The danger is a real one, but it is not peculiar to psychology. In this direction at least, I believe it is our duty to make the break with philosophy clean cut and complete. Psychology as special science has no right to metaphysical constructs. Her constructs must be her own. They must be scientific constructs in the narrowest sense of the word. And it is the

manifest duty of those who are interested in psychology as a special science to scrutinize every hypothesis that enters the fabric of their thinking and criticize them by scientific canons.

In view of all the evidence I believe that introspection is only one of the indicators of mental reality. It is a real and important indicator of peculiar value in special fields but it is only one of many. Equally real I believe is every pathological or neurological fact, every result of practice, training or fatigue that throws any light on mental capacity, mental organization, or mental defects.

PSYCHOPATHOLOGY AND NEUROPATHOLOGY: THE PROBLEMS OF TEACHING AND RESEARCH CONTRASTED[1]

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The ideas that I wish to bring to this symposium are few, and I hope not too unorthodox. How shall research psychology and research medicine come together, on what ground, and to what ends? I wish (1) to insist strongly on the unique value of the pathological method, not merely for the diagnostic and therapeutic purposes of medicine, but for biology as a whole and for the most vital of biological sciences, psychology. I wish (2) to point out how pernicious in research may be the dogmatic insistence on the doctrine of psychophysical parallelism in medical or premedical courses in psychology, pernicious because it inhibits the free interchange of structural and functional concepts and the passage to and fro of workers in the several sciences. I wish (3) to show that psychology and physiology have more in common than either has with such structural sciences as anatomy and histology, and that the main common element of both mental and cerebral processes is the time element as against the space-element of the structural sciences. On this ground (4) I conceive that the mind twist and brain spot hypotheses for the explanation of certain forms of mental disease are entirely consistent with each other, since from a different angle each is dealing with the same facts. (5) Above all let us not divide up the tasks of research as we divide up the tasks of teaching, since research, looking to the future, defies the compartments of the past.

"It always leads to a better understanding of a thing's significance," wrote W. James, "to consider its exaggerations and perversions, its equivalents and substitutes and nearest relatives elsewhere. * * * Insane conditions have this advantage, that they isolate special factors of the mental life.

[1] Read by invitation in a symposium at the meeting of the American Psychological Association, December 28, 1911, at the Government Hospital for the Insane, Washington, D. C.

* * * The study of hallucinations has in this way been for psychologists the key to their comprehension of normal sensation, that of illusions has been the key to the right comprehension of perception. Morbid impulses and imperative conceptions, 'fixed ideas,' so called, have thrown a flood of light on the psychology of the normal will; and obsessions and delusions have performed the same service for that of the normal faculty of belief."

I here quote from the *Varieties of Religious Experience*. It is perhaps in such complex fields as this that the natural analyses effected by disease possess their widest scope. Even where more artificial analysis is possible, the pathological method has often yielded the most fortunate short cuts. One of the richest generalizations of biology at large (the dictum *omnis cellula e cellula*) could hardly have been achieved by a commission of biologists empowered to study normal cells, and only normal cells, without decades of labor: the utilization of abnormal material gave a long range induction almost at once. The pathological foundation of the doctrine of evolution is obvious to any one who considers what survival of the fit means in terms of the unfit. The doctrines of immunity derive an indispensable constituent from the law of regeneration in surplus which Weigert observed in his studies of interstitial tissue. The bacteriology of disease has afforded some of the shortest cuts and the longest new ranges of thought of which we know or can conceive. The more complex the subject of our study, the less progress do we make by confining our attention to the normal presentment of that object. Normality is baffling, like the Roc's egg to the climbing Sinbad. A niche, a wedge, fragmentation, dissection, division of intellectual labor, all the screening and sifting which lie at the basis of experimentation, these characterize the method of pathology, which pays small heed to the pedagogical divisions of any former stage of a given science. The research pathologist follows the trail of the concrete through whatever ranges of the abstract become necessary, and through no others.

It is here that the school divisions of psychology and brain physiology, of psychology and brain anatomy, of brain physiology and brain anatomy, of anthropology and social statistics, of sociology and criminal anthropology, and a host of other abstract school divisions have entered to divert the research worker from his duty to the concrete complexity.

Particularly dangerous I find to be certain school tendencies born of the doctrine of psychophysical parallelism.

The teacher of psychology desires to keep *mind* logically distinct from *body:* the teacher of physiology disclaims expert knowledge of psychology: the teacher of brain anatomy almost skilfully avoids giving his point of view about anything remotely functional.

The student grows to a feeling that the confines and septa of pedagogy are the confines and septa of research. For the development of psychopathology and of neuropathology, which I consider to be school divisions of knowledge of no ultimate logical importance, no other single doctrine has, to my thinking, been so pernicious as the doctrine which proposes to separate mind and body before we know much about either.

Most of us remember James' neat critique of the *"Ohne Phosphor, kein Gedanke"* psychology. "The phosphorus-philosophers," said James, "have often compared thought to a secretion. 'The brain secretes thought, as the kidneys urine, or as the liver secretes bile,' are phrases which one sometimes hears. The lame analogy," continues James, "need hardly be pointed out. * * * We know of nothing connected with liver and kidney activity which can be in the remotest degree compared with the stream of thought that accompanies the brain's material secretions."

I remember smiling as a college student at the folly of these phosphorus men, thus dispatched at a blow. The fact is, a friend explained to me, *Ohne Gedanke kein Phosphor.* Thereafter I was not long in succumbing to the artistic simplicity of idealism.

It took me many years to learn that neither phosphorus et cetera nor the streams of thought could be dealt with so simply.

The proportions.

BRAIN : THOUGHT = LIVER : BILE

or

BRAIN : THOUGHT = KIDNEY : URINE

are obviously fallacious; but, if we alter the proportions slightly to

BRAIN : PROCESS OF THINKING = LIVER : PROCESS OF SECRETING,

and

BRAIN : PROCESS OF THINKING = KIDNEY : PROCESS OF EXCRETING,

we have destroyed the fallacy which James ridicules. We find

that liver and kidney activity have one important thing in common with the stream of thought—namely, activity itself, the temporal features of all processes whatever.

Ah! one more interactionist, I hear you say. No, I reply, that would hardly be fair: How can we prattle interaction, if we don't know the factors we declare to interact? These factors in the interaction-complex, I repeat, we simply do not adequately know either in the concrete or in the abstract.

If not a parallelist and not an interactionist what remains for a student? Must he not relapse into crusty mere critique or cowardly agnosticism?

Some years ago I ventured from my chosen path of brain analysis in mental disease at large to a discussion of dementia precox in particular. I found that practically everybody had taken sides. It had become a game: the hypothesis of psychic factors was strictly opposed to the hypothesis of encephalic factors. Tangles and twists in the mind appealed to some: blots and spots in the brain appealed to others.

Contrary to my presuppositions (I do not pretend to be exempt from presuppositions) I found in the brains of subjects suffering from something like dementia praecox, certain lesions, partly congenital anomalies, partly lesions acquired in the individual's life. I was led for the moment, and still feel the impulsion, to confide in the brain-spot hypothesis *for dementia praecox*.

Ah! then the secret is out! The writer believes that there are compartments in mental disease such that mind twists work here, brain spots there? No, I reply, I am not so naïve as that, nor are the facts so simple.

"They quote you," said a practical psychotherapeutist to me the other day, "to the effect that dementia praecox shows lesions, and is therefore incurable, and is anyhow not subject to my poor psychotherapeutic efforts."

"Who quote me?" said I.

"Why, the materialistic doctors of the clinic!"

This was the sequel of my well-meant endeavor to work on an apical problem! The facts are these: I am not convinced that we can safely entify dementia praecox in the first place. I am not sure that the anomalies and scleroses which I found are primary causes in the group. I am still less of the opinion that the changes are secondary to mental twists. I think the lesions are such as to interfere with proper cerebration, just as water on the knee interferes with proper walking.

"I have no objection to the lesions of dementia praecox,

if you do not regard them as *primary,"* wrote one friend to me. Precisely, I reply. The lesions are neither primary nor secondary. They, or the cell-arrangements involved permit or purvey the symptoms and signs of dementia praecox. The same facts viewed from one aspect are structural, from another aspect functional. Structure is in the main the spatial aspect of facts and events, function in the main the temporal aspect of the same facts and events. To say that mind precedes matter, or matter precedes mind is to say that time precedes space or space precedes time. If you look sharply at a frozen moment held as a sort of preterite before your eyes, you will hardly discover more than something structural. If you follow the object for a time, you will discern inner or outer changes in the object, qualitative, quantitative, positional, or relative, which entitle you to describe the object only in functional terms.

Brain changes and mind changes have at least this temporal aspect in common: whether both types of change are concretely identical is for research to decide. Pedagogy, the logic of the past, can decide nothing of the sort. Both types of change in virtue of being changes, *überhaupt,* are opposed to the structural, *ex hypothesi* unchanging, killed, fixed and mordanted objects which neurology describes.

Suppose then *for teaching purposes* we keep structure and function apart; suppose we even go a step farther and *for teaching purposes* separate function into two kinds, cerebral and psychic, I maintain that in research we should let the facts lead us where they will, over the hills and dales of physiology, into the deep borings of anatomy, or upward into the ethereal reaches of psychology. We have already weakened the pedagogical boundaries of many ancient sciences, and by new surveys, protracted litigation, and a thoroughgoing disrespect for precedent *coram factis,* we may achieve shortly new boundaries.

The majority of cases of mental disease are, I am convinced by special studies, characterized by the occurrence of obvious brain-lesions, i.e. even in the present stage of science they possess a structural pathology. Do they therefore possess no functional pathology? Their possession of the two aspects is a truism. Should we not study both aspects?

Furthermore, suppose we learn that, whereas three-quarters of our cases of mental disease exhibit obvious irrecoverable brain-lesions, another quarter fails to show these. Suppose the methods of microscopic research should still fail to show in many cases essential or irreversible brain-lesions,

should we not stultify ourselves if we did not abandon *for the research campaign* both that psychopathology which has taught us the main course of our disease and the neuropathology which has proved usefully negative? Should we not repair at once to the chemistry of metabolism, the physiology of internal secretions, and the entire point of view of pharmacology? Discoveries in the latter fields, concrete and pertinent facts, would carry us back to the tissues and back to the processes of the nervous system, to neuropathology, structural and functional, and to psychopathology, and enlighten many dark corners therein. He who adheres to the classical problems as they lie within the teaching divisions of any science is not apt to change the face of that science.

A PIGMENT COLOR SYSTEM AND NOTATION[1]

By A. H. Munsell

It may be assumed that this audience is acquainted with previous schemes by Lambert, Rünge, Chevreul, Benson and others:—also experimental results obtained by Maxwell, Helmholtz, Koenig, Rood, Abney, Wundt, Hering and Nagel.[2]

The germ of the present system was a twirling color model made in 1879 when as a student of painting I read Professor Rood's "Modern Chromatics." Experience with many students since then has led to its elaboration in a hope to clarify some of the vague and even false notions frequently entertained.

It is an experimental system built up with the aid of a new photometer, Maxwell discs and the trained capacity of the painter,—using a consensus of many individual decisions to gain the mean of color discrimination. A value scale (painter term for luminosity) was first made by measured dilutions of India ink, furnishing sixteen supposedly equal intervals from black to white. A *middle* value in this scale was next determined by the average choice of artists, dyers, salesmen and students to whom it was submitted, and from this middle point the gradations to white and black were equalized by Maxwell discs. But the eye detected a lack of continuity in the two halves of the scale, which was then rejected in favor of a logarithmic progression.

Thus, unsuspected, the law of sensation dictated the scale of values, instead of the intensity scale common to photometers, and the present daylight instrument was devised to preserve the conditions of studio practice, after having discarded the usual dark room installations with artificial light. An Aubert diaphragm was used to approximate the law of sensation:—but later, in constructing scales of *chroma*, an exception to the law was encountered, which has been noted elsewhere.[3]

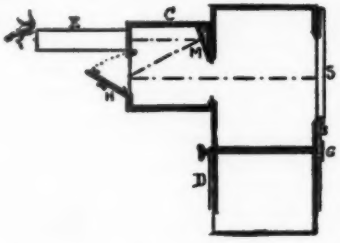
[1] Read before the American Psychological Association, Washington, Dec. 27, 1911.

[2] Lambert, 1772. Rünge, 1810. Chevreul, 1890. Benson, Clerk-Maxwell, 1860. Helmholtz, 1867. Rood, 1879. Koenig, 1894. Abney, 1896. Wundt, 1880. Hering, 1878. Nagel, 1908.

[3] *Psychol. Bulletin*, VI, 1909, 238 f.

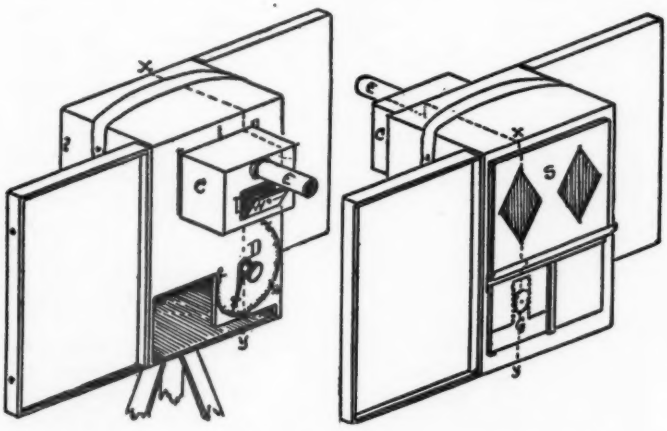
Method of classification

(Summary by Dr. L. J. Henderson of the solid described in "A Color Notation.")



" The principle of this classification of colors depends upon the recognition of three dimensions:—*value, hue* and *chroma.*

" These three dimensions are arranged as follows. A central vertical axis represents changes in value from white at



the top to black at the bottom,—the progression being a logarithmic one to correspond with the Weber-Fechner law.[4] The value of every point on this axis determines the level of every possible color of equal value.

[4] HELMHOLTZ. Handbuch der Physiologischen Optik, zweite Auflage. Hamburg, 1896, 384-480.

"Radial planes leading from this axis correspond each to a particular hue. Opposite radial planes correspond invariably to complementary colors: any three planes separated by 120° form a complementary trio, etc. Thus the angular position of any hue is determined, and the hues are balanced.

"Chroma, or intensity of hue, is measured by the perpendicular distance from any point to the vertical axis, and the progression of chroma is an arithmetical one, constituting the exception to the law already noted.

"Thus is constructed a solid. In this solid every horizontal plane corresponds to one and only one value. Every vertical plane extending radially from the central vertical axis contains colors of but one hue. Finally, the surface of every vertical cylinder having the vertical axis as its principal axis contains colors of equal chroma.

"In this solid every point corresponds to one and only one color, of definite value, hue and chroma, and when these three dimensions of a color have been measured its position in the solid is at once obvious."

What material form shall be given to this theoretic color solid? Spectral color would be the first suggestion because of its purity and the perfection of its instruments. But were it possible to embody the theory in spectral form, there would still remain its translation into pigments for the daily applications in education and industry.

There are serious pigment difficulties which must be met, such as fading and chemical reaction; and long technical experience is needed in handling pigments, so that inequalities of texture left by the brush, and uneven transparency affecting the relation of body and surface light[5] may not falsify results. The medium employed,—whether wax, oil or water, still further complicates the problem. Yet despite these limitations, some tolerably permanent visible form must be made and therefore pigments seem indispensable.

To meet these difficulties, expert knowledge is needed to devise tests and safeguards which will give the nearest approximation to uniformity. The scales must be made with the fewest possible pigments, which long exposure will not fade, and after careful scrutiny of their chemical composition. To avoid irregular behavior in the reflection and absorption of light, those selected for this system of charts have been ground in media which gives a matt surface when applied to a special ground.

[5] WILHELM OSTWALD. Letters to a Painter. Boston, 1907.

Each step in the united scales of value, hue and chroma is prepared by weight, brought to a proper consistency and applied with uniform brush work. If the resultant sheet fails to satisfy the three measuring tests it is discarded. This method is continued until a final sheet succeeds, and from this accurate sheet are cut the squares of color appearing on the charts. Protected from dust and the furtive hand, these scales will suffer only a slow change observable under the best conditions of opaque pigmentation. Visual discrimination being rarely less than two per cent[6] these changes are negligible for a long interval, after which fresh sheets will be supplied.

A color sphere established by the test of visual balance

Desire to fit a chosen contour, such as the pyramid, cone, cylinder or cube, coupled with a lack of proper tests, has

led to many distorted statements of color relations, and it becomes evident, when physical measurement of pigment values and chromas is studied, that no regular contour will serve. If a regular contour is desired, it will be necessary to bring the unbalanced character of pigments to a balance of complementary qualities, by selecting hues of equal light, strength and area.

For this purpose Rünge's sphere (1810) offers a convenient test, although the test at once reveals errors into which he fell:—partly by unmeasured assumptions as to the strength and light of colors, and also by the false but popular theory on which he worked. Strange to say that theory is still prevalent in primary education, although rejected by science for half a century.

Neutral gray is at the center of the sphere. It represents a balance of pigment mixture as white light represents the

[6] CHARLES PIERCE. Note on the sensation of color. *Amer. Journal of Science*, XIII, 1877, 249 ff. (Photometric sensibility of the eye the same for all colors.)

union of spectral hues. A circuit of pigment hues around the equator is formed of five complementary pairs,—all of equal chroma to accord with equal departure from neutrality, and of equal value to accord with the central level. The sphere is mounted so as to permit rapid rotation, which melts this equator of ten balanced hues in a band of neutral gray, proving by this visual balance that all degrees of sensation are compensated and constitute a true color equator.

Lighter zones to white and darker zones to black are similarly established, and at high speed the spherical surface fuses into a neutral gray, reproducing the axis with its regular scale of values from white to black. This retinal fusion begins to break up as the speed slackens, until a point is reached where a certain rate of presentation causes this hue-sequence to appear almost prismatic in vividness.[7]

This color sphere is evidently smaller than the complete color solid,—its equator being restricted to the chroma of the weakest pigment, since any enlargement of the diameter would leave that hue space vacant and destroy the balance. (Black pigments reflect nearly 20% of light and to balance this at the pole, a light grey replaces white.) The weakest pigment is a blue-green known as Viridian (sesquioxide of chromium), whose red opposite, Vermilion (sulphuret of mercury) is the strongest, with a chroma double that of Viridian. Hence, the equator of the sphere presents only the "middle" or half chroma of Vermilion with chromas less than the maxima in every case except that of Viridian.

The maximum red chroma therefore projects beyond the sphere and is below the level of the equator, with the purple and blue maxima lower still, while the maximum of yellow occupies a very isolated position nearly on a level with white. When these very uneven maxima projecting beyond the spherical surface are connected by intermediate mixtures and their series to white and black, they describe a most irregular shape which may be termed a *color tree*. The white-black axis becomes the trunk of this tree with branches extending horizontally to the maxima of red, yellow, green, blue and purple:—and upon studying its uneven contour, the "color belt"[8] is found to be a complex circuit whose steep inclination to the axis is a quantitative and qualitative statement of the strongest pigment mixtures.

[7] Probably produced by most favorable moment of fatigue of the complementary sensation.

[8] HOWARD C. WARREN. The Form of the Color Pyramid. *Psychol. Bulletin*, VII, 1910, 51f.

In this color solid the relation of axial length to diameter is an interesting question:—a space relation involving a study of the greatest number of discriminations in the white-black series as compared with a similar series of discriminations in the hue circuit. Also of chroma discriminations possible between complementary maxima. Koenig is quoted as ascribing seven hundred distinguishable grays to the axis with only one hundred and sixty distinguishable hues,—while Aubert[9] increases the latter series to more than a thousand. For a definite study of this ratio in terms of spectral hue and chroma, the apparatus described by Yerkes and Watson[10] seems admirably adapted.

This being a *pigment system,* led to inquiry among dyers and makers of colored stuffs, where one finds some twenty practicable grays as against more than seventy practicable hues in imitation of the circuit: and since the color belt—whether spectral or pigmentary—contains the differences of the white-black series plus the purples, it seems natural to infer that the belt presents the larger number of steps.

The angular distribution of hues is such that a single plane containing the vertical axis selects complementary pairs as determined by visual balance. When three planes separated by 120° are employed the retinal balance is composed of three sensations, while two planes mutually perpendicular give a balance of four sensations.

Another test consists in taking the opposite of red—blue-green—and separating blue from green by 72°. If this be the proper angle they will unite in a blue-green chroma corresponding to a chord joining them, and any other distribution would unduly crowd or spread the remaining hues of the circuit, destroying what painters call the balance of warm and cool color:—i. e. long and short wave-lengths.

A Color Atlas; charts presenting sections of the irregular color solid

The solid having been built up by equal and decimal steps of sensation, any sections must present regular scales of pigment light and strength. Horizontal sections present colors of uniform value in ten hue-radii of increasing chroma, from the common neutral center to the pigment maxima. Concentric circles contain equal chromas on all radii, and

[9] H. Aubert. Physiologie der Netzhaut. Breslau, 1865.
[10] Yerkes and Watson. Methods of Studying Vision in Animals. *Behavior Monographs,* I, 2, 1911.

an irregular outline describes the shape of the color solid at each level.

Vertical sections through the axis present a hue and its complement, in every step of value and chroma. A circle struck from middle gray shows the limit of the color sphere, the ends of each diameter selecting balanced complements. Oblique sections trace regular sequences which involve change of hue, value and chroma at each step. Such a series including the strongest yellow and strongest purple-blue gives a pigment imitation of the spectrum plus the missing purples.

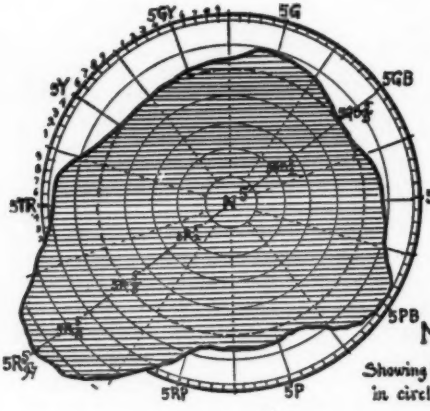


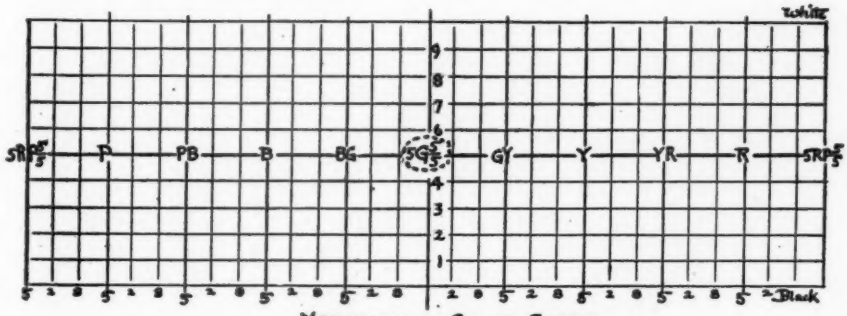
Fig. 20. Chart of Middle Value -5- Showing Unequal Chroma in circle of Hues. (See Fig. 2).

A Color notation[11] *for records and comparisons*

On each chart the steps of color interval are described by a simple notation consisting of an initial and four numerals. This gives their exact place in the related scales of value, hue and chroma. The hue scale is a closed circuit of ten equal steps traced by the initials of the five principals and their intermediates. It is written R (red), Y (yellow), G (green), B (blue), P (purple), and the intermediates YR, GY, BG, PB and RP. Each of these hues is in ten steps of value from black (0) to white (10) and also in ten steps of chroma from neutral gray (0) to the strongest maximum (10). An intersection of these three scales is written by an initial for the hue, a numeral above the line

[11] A. H. MUNSELL. A Color Notation. Boston, 2nd edition, 1907.

for value and another below the line for chroma. Thus "Middle Red" (midway between extremes of value and chroma) is written $5R\frac{6}{8}$. When first seen on the equator of the sphere this degree of red is likely to be rejected as untypical: yet it is the type which appears most frequently in beautiful combinations, while the extreme red generally taken as typical is usually absent, or if a small touch is introduced as an accent, it will be found to balance with a correspondingly large area of the weaker blue-green. When fixed in the visual memory, this middle red permits the thought to range by equal degrees to the limits of luminosity



NOTATION OR COLOR SCORE.

and strength, just as in musical training the middle register is the basis of judgment for the extremes.

Any variation of this middle red is at once defined by the notation. Thus $4R\frac{6}{8}$ is a slight change toward crimson without change of value or chroma. $5R\frac{6}{8}$ indicates no change of hue or chroma, but a lighter value of red, while $5R\frac{4}{8}$ represents unchanged hue and value, but with a weaker degree of chroma. This method applies to every point in the color solid, and by means of decimals, finer differences are possible up to the limit of visual discrimination.

A Color Score is provided for recording color groups and sequences

Suppose a transparent cylindrical envelope placed around the equator, and cut open at the red-purple meridian. This envelope spread flat is like a Mercator projection permitting us to plot any points of the color solid. It presents a rec-

tangular chart traversed by ten equidistant hue meridians, which are crossed by ten horizontal parallels of value. *Middle green* occupies the center of the chart, where the green meridian intersects the equator. Every point on this chart is equally significant of a certain value and hue, at the side of which may be written the intended chroma. Not only defining the *kind* of color sensation, this chart shows the *quantity* of any color by an enclosing line which is an expression of area. Significant curves traced on this score of measured scales describe individual sensitiveness to color. They serve to plot the groups and sequences which individuals find agreeable or the reverse. They also tabulate any desired or imagined combination of colors, and with practice in notation may be used to fix the memory of natural effects too fleeting for prolonged study.

Finally, by aid of the charts and models, there is set up a fixed mental image of all color relations.

The limits of this paper exclude reference to other practical applications of a definite color method in scientific and artistic education:—but one may feel justified in the hope that by providing what seems to be a sound mathematical basis for the description, comparison and classification of colors, there results an instrument that may be of use to psychologists.

THIS CHART WILL BE THE
THIRD CHART APPEARING
AT THE END OF THIS FILM.

THIS CHART WILL BE THE
FOURTH CHART APPEARING
AT THE END OF THIS FILM.

THIS CHART WILL BE THE

FIFTH CHART APPEARING

AT THE END OF THIS FILM.

THIS CHART WILL BE THE

SIXTH CHART APPEARING

AT THE END OF THIS FILM.

AN EXPERIMENTAL STUDY OF MUSICAL ENJOYMENT[1]

By HARRY PORTER WELD

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I. INTRODUCTION

The investigation which is here reported aims to make a contribution to the psychology of the appreciation and enjoyment of music. A variety of musical compositions were employed; plethysmographic and pneumographic records were made throughout. The chief aim, however, was to obtain a detailed and accurate description of the mental processes

[1] From the Psychological Laboratory of Clark University.

which were present, and to correlate these findings with the type of observer on the one hand, and with the type of musical composition on the other. It has been our hope to throw light upon the following problems: How does music produce its effects? What are the bodily correlates of musical enjoyment? What are the limits within which pure music may be used as a means of expression? What are the differences in the mental processes involved in the various sources of musical enjoyment?

II. HISTORY OF THE PROBLEM[2]

The psychology of musical enjoyment is intimately related to the problems of aesthetics; and it is impossible to review the literature of the former without taking the literature of the latter into account. With the problems of speculative aesthetics we are not immediately concerned. We shall therefore confine our attention, so far as possible, to those studies which have a direct bearing upon the specific topic of our investigation; and we shall venture into the field of the aesthetician only in so far as such a course seems to be demanded in the interests of a clear and systematic presentation of the findings of previous investigators of our problem.

Several writers have raised the question: To what extent is musical composition adequate as a vehicle of expression? Gilman (130), the pioneer investigator of this topic, employed a method which consisted in playing a program of thirteen carefully chosen selections (piano and violin) before an audience of thirty non-professional musicians; and the auditors were asked to answer certain definite questions regarding the effect of the music upon them. Downey's (128) method was similar to Gilman's save for the fact that she employed fewer musical compositions, in order to avoid fatigue, and she asked no definite questions, in order to eliminate the influence of suggestion. The results of both these investigators were negative in so far as concerns the ability of the composer to communicate scenes, incidents, or ideas (non-musical) to all of his auditors in common; but they indicate that music may arouse the same mood in the minds of several auditors. The investigation was continued by Ferrari (129) and Lahy (13) who refined the method but obtained essentially the same result.

Another question which has been attacked by investigators is this: What is the nature of the bodily reactions,—changes in the rate of heart-beat and in the distribution of blood supply, changes in the function of respiratory and other muscles,—which result from auditory stimulation? The pioneer investigations of Dogiel concerning volu-

[2] As originally prepared, this paper included a detailed description of the several contributions which have been made to the solution of various problems which are directly or indirectly concerned with the topic of our investigation. But the necessity for condensation has resulted in the sacrificing of certain sections, and the curtailing and recasting of others. In several instances, we shall be able to do no more than refer the reader to the papers which are listed in our classified bibliography. We hope to return to the discussion of various points which have been raised by previous investigators.

metric changes possess no more than historical value. Féré (94) reports that isolated notes and 'scales' have a dynamogenetic effect whose magnitude varies with their pitch and intensity. This result was confirmed by Tarchanoff (119) who also found that 'gay music or music of rapid tempo' neutralizes the effects of muscular fatigue; and Scripture (118), employing *motifs*, instead of isolated tones and simple sequences of tones, reports that he has confirmed the finding of Féré. In an investigation of the knee-jerk, Lombard (116) found that the amplitude of this reflex is increased in the presence of musical compositions,—and increased in different degree by compositions of different character. In a subject, part of whose skull-wall had been removed, Patrizi (117) was able to observe that tuning-fork stimuli and musical compositions increased the volume of the brain; but he failed to find that volumetric differences are correlated with differences in the character (gay or sad) of musical compositions. In an investigation of the effect of musical compositions upon pulse and respiration, Mentz (104) found that a retardation of pulse occurs with perfect consonances, with significant changes of tonal intensity, with the approach of the *finale*, and with the emotion of pleasantness; the heart-rate increases when the auditor concentrates his attention upon the composition and attempts to analyze it. Binet and Courtier (111) employed consonant and dissonant chords, major and minor intervals, etc., together with fragments of musical compositions, in an investigation of this same problem. They found that all of their auditory stimuli produced an acceleration of heart and of respiration; this acceleration was greater in the case of dissonant chords, major chords, and chords in rapid succession; the effects of musical composition are more intensive than are the effects of isolated chords. Gibaud's results (115) show an utter absence of uniform correlation between consonance and volumetric change,—a negative finding which this investigator refers to individual differences among his observers. Ferrari (113) made plethysmographic records of the effects of music upon normal and pathological auditors. Only in his idiotic and insane subjects did he find any vaso-motor change which could be correlated with musical emotion. The author refers these changes to an assumed absence of cortical control; and he employs his results as an argument against Lange's envisagement of the emotive process. Foster and Gamble (114) found that the effect of music upon respiration is similar to the effect of mental application in general, in so far as rate and amplitude of breathing are concerned; but they report that the regularity of respiration, which is characteristic of mental work, is lacking in the presence of music. In an investigation of the relation between 'Organic Change and Feeling,' Shepard (106) included a few experiments in which the effects of music were recorded by means of a plethysmograph. Agreeable and exciting music was invariably attended by a more rapid pulse, agreeably depressing music by a shorter pulse.

III. EXPERIMENTAL

1. *Preliminary Experiments.*—Our investigation includes a few preliminary experiments which were undertaken with a view to obtaining a general survey of the field, and a group of more accurately planned experiments which occupied our attention during the years 1910-11.

In the preliminary experiments, we had eight observers; five compositions were repeated at intervals with each observer, and the observers were asked, in the most general terms, to describe their experiences

under the influence of the music. These selections were played upon a pianola-piano; and in later experiments, a Swiss music box was employed. One hundred and forty introspective descriptions were obtained from these two preliminary groups of experiments; and these were supplemented by forty pneumographic and plethysmographic tracings. This preliminary survey of the field also included a printed list of questions which was sent to fifty of the most noted composers, critics, and teachers of America. It was hoped, by this means, to obtain information regarding the musical experiences of a great number and a great variety of auditors; but this mode of attack upon the problem proved to be barren of result, and none of the data which were obtained in this preliminary survey will be incorporated in the present paper, excepting in two instances where they will be referred to in passing.

The data upon which this paper is based were obtained in an experimental investigation of the problem which was undertaken in the psychological laboratory of Clark University. Our method of investigation consisted essentially in playing a variety of compositions in the presence of an auditor, and in obtaining plethysmographic and pneumographic records of such bodily changes in circulation and respiration as may have occurred before, during, and immediately after the rendering of the composition; and, in obtaining detailed introspective descriptions of such mental processes as were present.

2. *Apparatus.*—The apparatus consisted of a Lehmann plethysmograph and two Sumner pneumographs; one of the pneumographs recorded the thoracic, and the other the abdominal movements of respiration. The tracings were recorded by means of Marey tambours upon the smoked drum of a Zimmermann kymograph; the kymograph was so adjusted that the drum made one complete revolution in five minutes. A time line, marking seconds, was recorded upon the drum by means of a fourth tambour which was actuated by a metronome; the metronome stood in an adjoining room, and every care was taken to make our apparatus as nearly noiseless as possible. The music was furnished by a Victor Talking Machine (Model V.). This machine was equipped with a wooden horn; and fibre needles were employed throughout. In order still further to reduce the slight grinding noise, the Victor Machine was inclosed in a box, from which only the bell-shaped end of the horn projected.

The phonographic records were carefully chosen to avoid imperfections and to secure the best possible timbres. These compositions represented contrasts in tempo and rhythm, in form and style; and they included reproductions of the violin, cello, xylophone, string quartette, orchestra, concert band, and

military band. A list of these selections, with the metronome rates at which their various sections were played is appended:

Cradle Song, *Hauser*, Cello (60-63); Rondo from Serenade, Op. 525, *Mozart*, String Quartette (116); Diplomat March, *Sousa*, Concert Band (116); Angel's Serenade, *Braga*, Violin and Cello (126); Fifth Nocturne, *Leybach*, Violin Solo (50); New Tipperary March, *Fulton-Helf*, Military Band (120); Serenade, *Pierne*, Instrumental Quartette (88-92); Merry Widow Burlesque, Orchestra (160-132); Norma Selection, *Bellini*, Military Band (126-168-42-168); Mignon-Gavotte, *Thomas*, String Quartette (92-96); Songe d'Automne, Orchestra (62); Berceuse, *Godard*, Violin (42-52); Melody in F, *Rubenstein*, Violin (76-72); A Hunt in the Black Forest, *Voelker*, Orchestra (60-176-116-176); Minuet, *Paderewski*, Orchestra (120); Pearl Fishers Selection, *Bizet*, Concert Band (88-84-72); The Spinning Wheel, *Spindler*, Concert Band (13); Prize Song from Meistersinger, *Wagner*, Cello (69-66-63); Ernani Selection, *Verdi*, Concert Band (104-172-46-76); Leonore Overture No. 3, *Beethoven*, Concert Band (138-144-164); Badinage, *Victor Herbert*, Cello and Orchestra (116); Carnival of Venice, *Benedict*, Xylophone Solo (69); Humorous Variations on a German Folk Song, *Wollweber*, Concert Band (92-164-66-60-88); Hungarian Fantasie, *Tobani*, Orchestra (69-154-63-152); Carmen Selection, *Bizet*, Military Band (152-116); Spanish Waltz, *Nathan*, Concert Band (104).

3. *Method.*—Our method aimed to institute a detailed comparison between an auditor's normal respiration, heart-beat, and distribution of blood-supply, and the same auditor's respiration, heart-beat, and distribution of blood-supply while listening to music. The experiments were carried on in a quiet room on the third floor of the main building of the University. At the beginning of each experiment the auditor took his seat in a Morris chair with his back to the light; his right arm was adjusted in the plethysmograph; and the pneumographs were fitted to his body. Every precaution was taken throughout to eliminate any discomfort or distraction which might arise from the presence of the apparatus.

The reader need scarcely be reminded that a failure to observe these precautions would have vitiated the investigation; and he may be assured that, notwithstanding the fact that a complicated apparatus was employed, the auditors testified that their attitude and reaction were, after a few preliminary sittings, identical with their attitude and reaction to the rendering of a musical program under ordinary conditions. Indeed, the writer was surprised to discover that the auditors were wholy oblivious to the presence of the apparatus, save in two instances which will be discussed later. Not only did they report that they gave themselves up to the enjoyment of the music, but they also reported that they even were oblivious in most instances of the fact that the music was a phonographic reproduction,—they actually seemed to be in the presence of a quartet and orchestra, and they seemed to see the violinist, the conductor, and the various musical instruments.

When the plethysmograph and the pneumographs had been adjusted and had been connected with the tambours, a 'ready'

signal was given and the auditor composed himself as passively as possible. After a brief pause which was introduced in order to allow the auditor to recover from the distraction of the signal, the kymograph was set in motion and a preliminary record of the normal heart action and respiration was obtained. When the kymographic tracings indicated that passivity had been present for thirty or forty seconds, the music began.

The observer had been instructed to listen to the music in whatever way he pleased, but preferably in the way in which he usually enjoyed music. He had been told that when the music ceased, he would be asked to give a description of his experiences. The reader may suspect, as indeed the writer did suspect, that these instructions may have influenced the observer's attitude and reaction to the music. For this reason, control experiments were introduced in which the observer was assured that he would not subsequently be asked to give an account of his experiences. Every observer, without exception, reported that his attitude and his enjoyment were, so far as he was able to discover, identical in the two cases. Vocal music was not employed in our experiments; the name of the composer and the title of the composition were at all times withheld from the auditor, and no verbal or other extrinsic suggestion was given as to the nature or character of the selection.

Each composition required from three and one-half to four and one-half minutes. When the drum of the kymograph had completed its revolution, it was stopped and the observer began immediately to dictate his introspection. If, when he had finished his recital, any manifest variations in his kymographic tracings still remained unaccounted for, the experimenter attempted, by means of carefully worded questions, to lead him to supplement his description. A record was kept, not only of his answers, but of the exact wording in which the questions had been formulated.

4. *Observers.*—The observers in this experiment were all students in the Psychological department of this University. They were Misses S. C. Fisher (Fs.), B. E. Roethlein (R.), M. Van Waters (V.), E. L. Woods (W.), Messrs. E. S. Conklin (C.), E. O. Finkenbinder (Fn.), L. D. Hartson (H.), and G. H. Shafer (S.). All of these observers sing; H. is a vocal soloist. Fs. plays both piano and violin. R. and F. play the violin and H. the cello. W. has studied both piano and the voice but plays and sings little. C. and V. have studied no instrument. S. has sung in choirs, has taken a few lessons in singing and plays organ and piano in desultory fashion. As to ideational type, R. and V. are predominantly visual-motor, their auditory imagery is negligible. C. and S. are motor-visual with little if any auditory imagery.

H. and W. are motor, auditory, visual in the order named. Fn. and Fs. are of the balanced type with auditory imagery occupying a more important place in their ideation than is the case with any of the other observers. Especially does this hold true in the case of Fn.

IV. RESULTS

1. Physiological

Our plethysmographic and pneumographic records were undertaken chiefly for the purpose of controlling our introspections; but the physiological changes which were revealed are themselves of interest.

A. *Volumetric Changes.*—The act of listening to music was almost invariably attended by a decrease in the volume of the fore-arm; this phenomenon occurred in ninety per cent. of our cases. The decrease occurred almost immediately,—within two to five heart-beats after the music began. Certain auditors are characterized by the fact that this initial drop in the volumetric curve is abrupt and precipitous; while in other auditors the change of level in the plethysmographic curve is always gradual and of relatively slight amplitude. It is an interesting fact that the former group of auditors are more active, more alert, more volatile, while the latter group tend to be more indifferent, more phlegmatic, more deliberate. The subsequent course of the curve assumed one of several forms: it either remained at a low level throughout, or it gradually rose to about the initial level and there remained, or it ultimately attained a height above the level of the fore-period. In addition to these changes in the general course of the curve, it frequently happened that the plethysmogram showed a brief undulation, in an upward or downward direction, at some point in its course.

The writer is convinced that these volumetric changes are essentially phenomena of attention; it proves to be possible, in every instance, to correlate these characteristic changes with changes in the nature or condition of attention. After the experimenter had obtained an insight into the individual differences among his auditors, and had acquired experience in the interpretation of his plethysmograms, he found it possible to predict what phenomena of attention would be described in the auditor's introspection. For instance, when the volumetric curve, after its initial fall, continued at a low level throughout the observer never failed to report a constant, continuous and intensive concentration of attention; abrupt undulations of the curve coincided with abrupt variations of attention or rapid flittings of attention from one objective point to another; a return of the plethysmographic curve to its initial level indicated the presence of relatively passive attention, and an ascent above the initial level is correlated with reverie and dreamy states.

B. *Heart-rate.*—The heart-rate was usually accelerated during the music-period. This acceleration began during the first few seconds, and was usually maintained throughout the whole music-period. There was, in general, no correlation between the tempo of the music and the change of heart-rate,—even the slowest musical tempos, which were much slower than the normal pulse, produced an acceleration of pulse, and the most rapid tempos had no more accelerating effect *per se* than the slowest tempos.

The normal heart-rate (fore-period) of our auditors varied from day to day,—one auditor varying between the limits of 63 and 88, another between 72 and 92. The rate during the fore-period exceeded the rate during the music period in less than ten per cent. of the cases; and it

was found that in all of these cases excepting one the rate during the fore-period had been abnormally high.

This phenomenon of acceleration of pulse proved to be so frequent and so independent of the tempo of the music that we were led to suspect the influence of the suspense and expectation of the fore-period, and perhaps even of relaxation, during the music-period. Accordingly we compared the heart-rate of the first minute and of the second minute of the music-period with the rate of the fore-period. We found that the first minute showed an acceleration in eighty-five per cent. of the cases, and the second minute, in eighty-one per cent. of the cases; the first minute showed a retardation in nine per cent., and the second minute in eleven per cent.; the heart-rate remained unchanged during the first minute in six per cent. of the cases, and during the second minute in eight per cent. of the cases. Our records show no constant correlation between heart-beat and rhythm; and a correlation between tempo and heart-rate is found only in those musical compositions where the observer reported that the rapid tempo produced an exciting effect.

C. *Respiration.*—The most striking changes in the respiration of the music-period are acceleration of rate and irregularity of amplitude. We have been able to discover no relation between increased rate of breathing and musical tempo. In certain auditors the accelerated respiration is also more shallow; in one case there is little or no change in depth, and in certain other cases the amplitude of respiration is so exceedingly irregular during the music-period that it is difficult to compare it with that of the fore-period. A comparison of thoracic with abdominal respiration has revealed no striking or illuminating differences.

In certain of our observers, changes in respiration were by far the most striking physiological effects of music. Those auditors who were characterized by active attention breathed in more rapid and shallow fashion than during the fore-period; while in those auditors whose reaction was essentially emotional, respiration was exceedingly irregular both in rate and in amplitude. (See plate F.) In the latter auditors the respiration tends to 'follow the music,'—to accelerate, to hold, to retard, when the music accelerates, holds or retards; and these variations in rate of breathing are attended by corresponding variations in depth.

No correlation between respiration and phrasing was discoverable in the records of our investigation. But an additional series of experiments was arranged for the purpose of determining whether such a correlation is present when the auditor attends especially to the phrasing of the composition. Here it was found that the beginning of each phrase coincided either with the beginning of an expiration or with the beginning of an inspiration,—the former occurring much more frequently than the latter.

Our plethysmographic findings, and our interpretation of these results are in accord with the statements of Angell and Thompson (89; 67 ff.). Our interpretation of the abrupt alternations in the volumetric curve is in agreement with that of MacDougall (103; 165). Stevens (108) refers the initial fall in this curve to certain physiological effects which are produced by external stimulation; and while it is true that in our experiments the fall was usually abrupt in proportion as the musical stimulus was intensive, yet our introspections indicate that initial as well as subsequent changes of level of volumetric curve find a much more thoroughgoing correlation with changes

in the auditor's attention than with changes in objective conditions of stimulation. We do not feel that our investigation can furnish evidence as to the nature of those physiological processes which attend the emotional states of pleasantness-unpleasantness and excitement-calm. Under the conditions of our experiments, these emotions came to consciousness in such highly complex form, and such great variations of attention were involved, that the contribution made by the isolated action of any single factor could not be determined.

Our results regarding the effect of music upon heart-rate confirm the findings of Binet and Courtier (111) and of Shepard (106). Mentz (104) however reported that the pulse is retarded when the auditor's attention is passive. We cannot assent to this statement. It is true, however, that if while listening to music the observer's attention is at first active and subsequently becomes passive, his heart-rate will be found to be slower during the latter stage than during the former; but even during the latter stage the rate is faster than it was before the music began. Our negative correlation between pulse and tempo is in opposition with the views of Riemann (28) and of Steinitzer (19), both of whom assumed that the normal pulse is the criterion by reference to which we estimate rapidity or slowness of tempo. Indeed Hallock (79) has carried this so far as to compute the normal heart-rate of Beethoven from an analysis of his sonatas. But we have wholly failed to find any correlation between rhythm or tempo and pulse. In musical productions the length of the rhythmic group varies in consequence of acceleration, retardation, rubato, pause, forced accenting of tones: the pulse does not respond to these variations.

Although in confirmation of the findings of Dogiel (112), Leumann (102), Mentz (104), Meumann (65), Squire (69), and others we have found that respiration is disturbed by auditory rhythms, yet even here there is no constant correlation or coincidence between the auditor's respirations and the rhythms which he hears. The nature of the disturbance is rather a departure from the regularity of normal inspiration and expiration; and this divergence is proportional rather to the intensity of emotion than to the nature of the objective rhythm. Our observation that respiration conforms to the phrasing of the music, when attention is directed to the phrases, supports the contention of Riemann (28).

The respiratory function is more peculiarly adapted than any other function of the whole bodily musculature for the execution of those empathetic and sympathetic movements which are emphasized by the advocates of *Einfühlung* and *innere Nachahmung*. And it is in variations of respiration that one would expect to find that these variations of pause, retard, acceleration and rubato can be imitated as by the bow of the violinist. A survey of the pneumographic records which are reproduced at the close of this paper will show that all of these variations of respiration are illustrated in our findings.

2. Introspections

Our introspections reveal the fact that the 'music consciousness' is made up of a mass of kinaesthetic and organic sensations, motor, vocal-motor, auditory and visual imagery, numerous associations many of which are irrelevant, affective and emotional processes, and various phenomena which have to do with intellectual enjoyment. We shall analyze this material under the following heads: A. Visual Imagery; B.

Auditory Imagery; C. Actual or Imaged Motor Reactions; D. Reactions to Descriptive Music; E. Emotions and Moods; F. Individual Differences.

A. Visual Imagery

All of our observers frequently reported visual imagery in connection with their musical experiences. Often, however, this imagery was nothing more than that which is ordinarily concerned with thought processes; it had no direct or peculiar relation to music. Many times it consisted of the visualizing of objects which were associated with previous auditory or motor experiences of the individual,—for instance, one observer visualized *staccato* notes of high pitch as bright points of steel, another as sparks of light, still another as drops of rain falling on water; a flitting movement in the music evoked the visual image of fairies, etc. Frequently also, visual images were called up through association by contiguity; one observer reported 'this composition called up a visual image of the surroundings in which I heard the same composition last night.' Such simple associations have no especial significance for our problem, and need not be discussed further.

With three of our observers the visual image may and often does occupy a very important place in musical experiences. Their imagery is much more detailed; it often assumes the form of a drama or story in which an emotive content is clearly expressed. Usually the form or schema of the drama or story shows a striking resemblance to the form or schema of the musical composition.

Observer R.—Spanish Waltz, Band. 'I was in a ball-room, not dancing but in evening gown. It was a military ball with a military band; officers and women were there. When the music began, I saw a dance which I had never seen or danced before, but it was appropriate to the music. First, each couple danced two turns together, then jumped. Then the man of one couple took two steps to the left, the girl two steps to the right, and the *vis-a-vis* couple approached and passed between. Third, the first couple came together and the second pair took the place which originally had been occupied by the first. The former pair approached and passed through as before. Every one was laughing and having a good time, because it was a new dance. Then I saw another dance; same surroundings. A man moved toward a woman and made a courtesy to the movement of the music; they did not turn but went backwards. This was done slowly—very slowly. I could not get the exact step; I could not follow it though I tried, because the lady's dress attracted me so much. When this dance was over, the original couple were standing in their original position, and each person made a low courtesy. Everybody seemed to be waiting for something; all were standing in a row. Suddenly the first dance began again; but now there was a slight variation because they were not standing in exactly the same positions.'

An analysis of the above image or scene reveals the presence of three distinct dances; the first, lively and accompanied by much laughter; the second very slow with no turning but with courtesies; and the third, a repetition of the first. A musician will instantly recognize this analysis as a good description of that form in music known as Simple Ternary,—a form in which many compositions of this class are cast and which is usually described as consisting of three sections, the third a repetition of the first, and the second in well-marked contrast to the other two. If we represent this form by the symbols A B A, it will be clear that the first dance of the image lasted throughout the first A of the music; the second dance occupied the B of the music; and the third dance, the second A. So far as the observer was able to recall the exact movements of the dance, they coincided with the phrasing of the music; the place in the first dance where the participants 'jumped' is clearly suggested by a 'wide interval' ascending in pitch at the close of the phrase.

Observer R.—Thomas, Mignon Gavotte. String Quartette. 'When the music began, a friend appeared by my side. Near by was a hotel containing a little theatre. We were looking out of our window, and through the window of the theatre we could see everything on the stage. Women were on the stage singing; their faces expressed emotion; they seemed to be telling something but before they got to the point, they changed their minds and stopped. We were so far away that we could not hear the words but we saw them acting it out. Then men approached upon the stage; they sang the same thing, and stopped just where the women had stopped. When the men had finished, the whole party left the stage except one woman and one man. She began to tell him of her love but stopped and left her recital uncompleted as before. Then they both sang in duet to the end. All was happy and gay. We enjoyed it thoroughly; we could not refrain from giggling as we looked on the stage and saw the performance.'

(When the observer had finished her introspection, she was released from the apparatus and the music was played a second time for the purpose of determining exactly at what point in the selection each change in the observer's picture had made its appearance. It was found that the setting (picture of a stage) had been suggested by the opening chords of the music. The observer was entirely unable to explain why the setting should take this particular form; she reported, however, that *pianissimo* effects always suggested distance,—'It is far away; I am not there.' She could recall no experience in her life which could explain why this particular group of imagery now came to her consciousness except that once many years ago, from a fourth story window, she saw a procession upon the street. After the opening chords, the song of the women continued until the repeat; at this point, the men took up the strain and sang to the end (double bar). The contrast section was pictured by the observer as being not vocal but instrumental, during which the chorus withdrew; and during the

recurrence of the first section, the two voices carried the melody which had formerly been sung by the combined male and female chorus.)

Observer V.—Bizet, Pearl Fishers. Military Band. 'I saw street Arabs in the Midway;—then I saw soldiers dressed in electric blue; sometimes it seemed like a circus parade—then like a military parade. The scene changed toward the end, and I seemed to be in a church. I heard the organ but could not see the organist. I saw robed figures; as they marched, something swayed back and forth, maybe censors. Near the end where the heavy chords came, I thought of a triumphal anthem and 'I went along with it.'' In the next experiment, five days later, this composition was inadvertently played a second time. The robed figures came in as before; but on a stage instead of in a church. 'The priests came on the stage, the pipe-organ was on the stage; I did not feel the triumph, but I felt a solemn thanksgiving—not exultant as before. I think the change was due in part to a change in mental attitude; all the sincerity of it was gone. Before, I lived it. Then the priests were in church, they were really celebrating a triumph in the Middle Ages. Now, it was acting on the stage.'

Several features of these introspections and of numerous similar introspections which might be cited, are significant. (1) The imagery is invariably full of movement; this is characteristic not only of every visual image of this type reported in this experiment, but also of visual images in the preliminary experiments. (2) These movements always bear a direct relation to the 'movements' of the music,— such as rhythm, phrasing, etc., often changes in pitch where such changes are characteristic. In the case of observer R., we have several times compared the images, phrase by phrase, with the music. The outline of the imaginal experience invariably conforms to that of the music. If the movements of the musical composition are rapid and flitting, the movements in the visual imagery are rapid and flitting. If there is a sudden pause in the music, the movements of the imagery suddenly come to a stop; then as the music continues, the movement of the imagery continues. If the melody of the music is often repeated, the movements of the imagery are as frequently repeated. The fidelity with which the imagery follows the movement of the music may be more clearly seen in the fact that if the imagery is localized upon a stage, as frequently happened, R. never sees the curtain fall. The figures on the stage continue their movements until the music stops; at that instant, the whole imagery melts and disappears like a fairy scene. While no one of the eight observers in this experiment had such complete and such detailed, clear-cut visual imagery as did R., yet the same characteristics are present, even if in lesser degree, in every instance of visual imagery of this peculiarly conformable type. See, for example, that of Fs. below, (p. 275) where the

Indians solemnly shake hands to the rhythm of the music, and where the visual imagery of the Indians on a stage gives place, at a change in the music, to a scene in a stock exchange; or those of V., where a procession in the street changes to a procession of priests in a church,—a transformation suggested, evidently, by chords in the music which suggested the pipe-organ; but both scenes are processions ('the march *Takt*'). There is, however, a vast individual difference in observers as to the number and character of the movements suggested by the music, which are carried over into the visual imagery, *e. g.*, one observer often had no other movement in the visual image than the swaying of a field of wheat, of a tree, etc.

The mood which suffuses this imagery is also of interest. If the music is gay, the visual imagery portrays a gay scene; if the music is a solemn and stately march, the visual imagery has the same character. The expression of the faces usually portrays the dominant or changing moods,—'Girls were so happy,' 'The man was very sad; I could see it in his face.' One auditor insists that this is always *her own* feeling, and that the mood is the result of the music. The visual imagery also frequently portrays the change or movement of feeling in the dimension excitement-repose; *e. g.*, Fs. had a visual image of a group of men waving their hats and selling stocks. 'I never saw a stock exchange, but I was much excited; I could see the excited faces.' R., while listening to a cello solo, visualized a man who was singing 'with more and more feeling.' Instances of such induced feelings and moods are of frequent occurrence in our introspections.

Finally, it should be clearly borne in mind that this visual imagery is entirely involuntary. Observers unite in disclaiming any attempt at trying to invent a story that will fit the music or that will explain the music. Their attitude is rather one of curiosity as to what is going to happen; occasionally incongruities appear which cannot be explained, as for example, 'I cannot imagine why people should dance to such music;' another was much surprised to see lions in a political parade. When asked for an explanation she concluded that the presence of the lions was due to a phrase in the music which might have suggested the roaring of lions.

The observer is often unable to recall any previous experience which will explain the form or content of his imagery. There are exceptions, however, as when one observer reports, 'Music always suggests things I read about as a child; I visualize childhood stories.' In one of the preliminary ex-

periments an observer saw a procession of men dressed in Greek costumes marching in a grove. He added that while a boy he had been extremely fond of stories of the Greeks. On the other hand, another observer visualized city streets, buildings, interiors, individuals and situations she had never seen before. It should be remembered however that she never created an impossible or incongruous situation; and that the details of her pictures were either similar to those of common occurrence or could be accounted for in her previous experience.

Visual imagery seems to be entirely unnecessary so far as the enjoyment of music is concerned. Occasionally an auditor reports that some feature of the image had an interest *per se;* but on the whole they agree that the music occupies the focus of attention and that the image is accessory. On the other hand, there is always the possibility that the possession of such concrete imagery may give definiteness to an experience that might otherwise be vague and abstract. Concerning this, however, our observers were unable to give an opinion.

How are we to account for the arousal of these images which are characteristic of the music consciousness of certain observers? They are apparently sporadic and oftentimes irrelevant; yet it cannot be denied that in certain individuals they contribute to the enjoyment of music.

Wallaschek (127; 120 f.) and MacDougall (137) are the only writers who have attempted to explain the origin of this imagery, although several investigators,— Gilman (130), Downey (128), Lahy (131), Pilo (126).—have reported the presence of imagery which is wholly analogous with that of our observers. Wallaschek refers the phenomenon to the alleged existence of a visual type in music which is comparable with the visual type in ideation in general. MacDougall has recourse to the traditional laws of association, — contiguity, resemblance, emotional congruity. The phenomenon of colored hearing has also been appealed to; but this factor can be operative only in exceptional cases.

The introspections of our observers show that the 'movement' in the musical composition is the essential factor in determining what is the character of the visual imagery that shall be aroused. We have invariably found a most remarkable parallelism and congruity between the variations in the 'pace,' the pitch and the rhythm of the music on the one hand, and the movements of the visualized objects on the other. And this parallelism is no less evident in connection with the general form or the larger unities of the musical composition.

We are convinced that the traditional laws of association are powerless to explain the visual imagery which our introspections have revealed. Numerous introspections which shall be quoted in detail (p. 268) leave no room for doubt that movements,—real or imaginal,—in the body of the observer himself, are correlated with the objective movements of the music; and there seems every reason to believe that these bodily movements determine the direction and the general character of the visual imagery. It must, however, be added that mood (emotional congruity) also plays a part here. But the mood is so intimately related with the 'activity' of the music that the former seems to be a product of the latter. The significance of this factor has been emphasized by the advocates of *Einfühlung,* in its various aspects, and *Nachahmung,* to which we shall recur later.

B. Auditory Imagery

Auditory imagery was reported much less frequently than visual imagery. This may mean either that auditory images were really less frequently present, or that the presence of an objective auditory stimulus constituted relatively unfavorable conditions for the detection of auditory images. In other words, the more intensive,—perceived,—datum may have obscured and swamped the less intensive,—imaginal,—datum. However that may be, it was discovered that those of our observers whose auditory imagery is normally weak and ill-defined tended to report motor imagery during the act of listening to the music.

Four of our eight observers wholly failed to discover the presence of a single auditory image during the whole series of experiments. In the case of the other four observers the auditory images varied in frequency and in significance between extreme limits. One observer reported that their appearance was rare and sporadic; another reported that they were invariably present, usually in great profusion; and the findings of the other two observers fit in between these two extremes. In one observer the essential content of consciousness consisted almost exclusively of auditory imagery; his procedure throughout consisted in "playing with his tonal imagery,"—in recalling the notes which had just been heard and in anticipating the notes which would follow,—both in auditory terms.

Obs. Fn.—'I 'thought' the music; the imagery was vague and subtle; auditory images, with perhaps innervation of throat; I anticipated the sounds before they actually came; when I anticipated correctly, it

added to my pleasure. During the interlude I had an auditory image of the figure played by the first violin, and also of a bass accompaniment; the latter I may have sung, the former was too high for me.'

'The first four tones of the same pitch led me to anticipate that something different must follow. These four were all in consciousness at the same time, as were also the two tones which followed,—auditory imagery throughout; at the end of the sixth note, a feeling of pause with expectancy, a comma as it were; the remainder of the phrase is in apposition; the second half is similar to the first, but I could not analyze the similarity. From here on, I noticed many variations of the original theme; the similarity was there, but the composition was too unfamiliar for me to analyze; I cannot say wherein the similarity or difference consisted; my difficulty here, I feel sure, is due to the fact that I cannot recall; I cannot hold the variation together to compare it with the original theme; I no longer remember the notes which are just passed; I was conscious of no innervation of the throat; but I cannot now call up the theme without vocal movements. I had difficulty with the first of the two abrupt pauses in the composition; I went on with my auditory imagery while the music held, and it all disturbed me; at the second hold, I paused; I had a vocal motor image of "I should have known better," and smiled when I remembered that as a child I had sung through a pause in just this way. During this time, the music passed out of the focus of consciousness for a few bars; indeed, my attention fluctuated several times in this fashion; there is much pleasure in the recognition of the transformed *motifs*. It frequently happens that several tones have come before I catch their relation to the original theme.'

'About twelve measures after the interlude I enjoyed the entrance of the tenor of the harmony a third above the air but a variation. I hummed the tenor part at first, then I began to predict the next note; this was auditory imagery; I did not have time to vocalize. I just listened, anticipated, compared. All this was in auditory imagery. I had no other thought than the music itself. I listened, compared phrases, expected what was coming, all in auditory imagery, but when the cello came I could not help vocalizing. I made no noise but felt the strain. I thought the cello part was fine; it was such a good contrast. Then my mind drifted away. Near the end I noticed particularly the sequences. I knew that the composition was working up to the end,—to the climax. Often throughout I predicted what was coming. I call up in auditory images what I have just heard. I measure the duration of each tone and compare each tone with the other.' (See also p. 287.)

Any attempt to interpret these findings leads us at once to a discussion of such questions as the perception and the recognition of motives, harmonies, melodies, etc., the analytic attitude of the auditor, the basis of auditory memory, and the like. And while we can not hope to furnish a final solution of these much vexed questions, it does seem that our findings throw light upon these problems.

Inasmuch as all of our observers had had a life-long experience of Occidental music, their attitude toward musical compositions had already become a highly complex, a definitely established and a deeply-rooted product. For this

reason it was obviously impossible for us to hark back to primitive and pre-experiential conditions; in consequence we have been unable to trace out the genesis and development of such complex perception of melody and harmony in so far as that perception involves tonal relationships, consonance and dissonance.[3]

The art of music demands that successions of sounds must be apprehended as groups; and the ability to apprehend successive stimuli as groups presupposes the ability to retain in consciousness, or to recall to consciousness, those elements of the group which have already been heard, i.e., a *sine qua non* of the rhythmic group is that the first element should not be lost to consciousness before the last appears. It is obvious then that auditory imagery may be of distinct service in the appreciation and enjoyment of music. It is of course not our purpose to raise the question as to whether auditory or indeed other imagery is indispensable to the appreciation of music; the question of the indispensability of the image in such functions as perception and recognition has already been answered by psychology in the negative. Yet the function of the image in difficult and non-mechanized recognitions need scarcely be mentioned. Nor does it seem necessary to show that the auditor who possesses a profusion of auditory imagery will *ipso facto* be better qualified not only to detect the recurrence of *motifs*, but also to appreciate the composer's modifications and exploitations of his original *motifs*. It is of course true that the auditor who is characterized by a dearth of auditory imagery may have recourse to indirect means,— to surrogate imagery or to certain other makeshifts.

Those of our observers who reported no auditory imagery were yet able to recognize melodies, and to detect the reentrance of *motifs* and phrases. Their procedure was of several typically different sorts. One observer adopted the expedient of visualizing the pitch-outline in graphic form. Others made use of their motor reactions; they either imagined or executed movements which conformed to the accentual relationships of the *motif* or the theme. Still others employed the emotional tone,—the plaintive, weird or joyous character,—of the *motif* as a criterion for recognition. But these are, after all, indirect means for the accomplishment of

[3] The reader who is interested in these problems is referred, for a general treatment, to Titchener (52; 360), and for a more detailed discussion, to Lipps (14, 450), Stumpf (48, 49), Wundt (53; 138), Max Meyer (47, 456), Lalo (11, 184), Bingham (45), etc.

an end; and the composer's development of his theme proceeds in such subtle fashion that its minuteness of structural detail cannot be perceived by the auditor who has grasped but a single feature of the original *motif*. It is, in our opinion, not merely a remarkable coincidence that the observer who was characterized by the greatest facility in the use of auditory imagery was also characterized by the keenest capacity to apprehend the structure and significance of musical compositions.

Our introspections show, however, that a profusion of auditory imagery is not the sole essential for the appreciation of musical compositions. And the very fact that the attitude and procedure of our several observers manifested such typical individual variations as they did, threw the function of the various component processes into high relief and thereby facilitated our work of analysis. These several attitudes and procedures may be represented as series of increasing degrees of intellectual analysis. In those cases where the analytic characteristic was present in least degree, attention was always claimed by some other feature of the composition or its emotional or associative constellations. The observer in whom the analytical attitude was habitually present in high degree was found to assume a wholly different attitude when for any reason the composition failed to furnish an interesting problem or situation for analysis. For instance, a burlesque upon a popular melody soon ceased to claim his attention; and he wandered off to an irrelevant train of associations. But these observers reported that such an attitude was present only in exceptional cases,—when the composition was inherently mediocre or when it was so novel and complex that its significance could not be grasped, and the auditor abandoned all hope of successful analysis. On the other hand, certain observers habitually assumed an attitude in which the analytic function played a minor rôle; here the emotions and the play of uncontrolled imagery were in the ascendant.

It is clear that the musical phrase must not transcend the limits of the span of attention since the phrase must be apprehended as a unit, although it is itself composed of a number of measures. And it is equally clear that practice and familiarity with musical materials must serve to facilitate the task of the auditor in whom the intellectual attitude is habitual and typical. When a musician listens to a musical composition he has in his mind a mass of material, which constitutes a criterion by reference to which the composition

is to be interpreted. He knows the laws of melody, of counterpoint, the construction and progression of chords; every tone of the melody, every chord in the harmony has a name which is of service in its recognition; he knows the musical forms,—fugue, sonata, rondo, and as soon as the form is recognized, he knows further what to expect. Moreover he is acquainted with every means to which the composer has recourse for the furtherance of his musical thought,—augmentation, diminution, transposition, inversion. All of these technical devices become symbolized, as it were. The concrete auditory image upon which all his experience is based tends to drop out and the symbols take its place. The whole mental process becomes complex. All previous experience, education, environment, mental type, go to form the general attitude, the *Einstellung,* which the individual brings to the enjoyment of music.[4]

C. Motor Reactions, Actual or Imaged

Bodily movements, actual or merely imaged, were reported by all observers save one, and she invariably reported visual images which were themselves full of movement. An analysis of the introspective material shows a motor reaction to the rhythm of the measure, a motor reaction to the rhythm of the group or of the phrase, and certain correlations between muscular movement and tempo (rate of speed). One of the interesting problems resulting from the study of this material is the correlation between the objective movements suggested by the music and imaged or actual movements executed

[4] In addition to the intellectual attitude which is described here, and to the emotional attitude which will be discussed later, it seems possible to differentiate certain other typical attitudes in listening to music. Gehring (*22*; 49 ff), Norton (*125*; 190), and others have described the 'symbolic' or 'idealistic' attitude. This *Einstellung* is represented in those auditors who regard musical compositions as an expression, in symbolic language, of human emotions and activities. For instance, musical discords are symbolic of human discords, the complexities of musical structure symbolize human conflicts. The musician who seeks to discover in the compositions of any period an expression of the dignity and stateliness of that period, or of the social unrest of the period belongs to this type. But no representative of this type was found among our observers. We did however discover a variant from the purely intellectual type. The typical procedure of this observer consisted in conceiving the phrases as question and answer, as statement and repartee, as interjection, as amplification, and the like. The music took on the character of a conversation; the first phrase began to tell a story, the second phrase interrupted with an interjection; then the third phrase continued the recital only to be interrupted by further interjections from the fourth phrase, etc.

by the listener. In this connection we shall offer some introspections showing a motor reaction to changes in pitch and intensity, a kinaesthetic localization and seriation of tones in space, and the suggestion of approach and recession in consequence of changes in intensity.

a. Reaction to Takt.[5] Motor reactions to the rhythm of the measure are illustrated by the following excerpts from our introspections:

Fn. 'I felt a strong tendency to move my head with the music.' 'I noticed a tendency to keep time with my foot; my foot stopped when the music held.' V. 'A tendency to move my eyes rhythmically; my eyes are inflamed so that I can feel the pull of the eyeball.' H. 'I noticed the motor sensations throughout,—in hands, fingers, head, upper arm. Near the close I thought of a waltz and had slight innervations in upper leg.' 'Found myself keeping time with my teeth; transferred it to biceps, then to my toe.' Fs. 'I marked time all the way through except at cadenza.' 'I marked the rhythm with both feet; one foot marked the first beat of each measure, the other foot the remaining three beats. There were also slight innervations in the left hand.' 'The whole thing was full of movement; a flashing visual image of the experimenter beating time, of a band master, his whole body alive, tense and alert, muscular sensations of dancing myself. I beat the time with right hand, with both feet at times, at other times with only one. A more decided kick with accented notes.'

Introspections follow showing a tendency to execute movements of swaying and swinging with the music; this movement was not in unison with the *Takt* but was in accordance with the first accented member of the group, or with the larger rhythm of the phrase.

Fn. 'I swayed, felt as if the whole body were breathing' (this to the phrases). 'My head rested on my left hand; my fingers were over my eye-brows; when the melody began, my pulse throbbed; I felt a swaying; I could not listen to the music and inhibit my movements.' W. 'I caught myself breathing in exact time with the phrases.' H. 'I felt as if my whole body moved with the swells, like the swinging of the bow of the violin.' S. 'The rhythm became apparent as the music began; I seemed to swing right into it; I had no tendency to keep time with foot or hands; the thing was in my whole body, hardly perceptible.' Fs. 'I experienced a distinct motor image of my arm moving.' 'I got a motor image of two-stepping; I seemed to feel myself dancing.' W. 'Felt as if I were being rocked in a cradle.' V. 'I was conscious of a feeling of rhythm, of swaying like a wash of water.' 'I felt as if there was a movement inside of me, something moving to the rhythm of the music. It is like a sensation of strain, first on one side and then on the other.'

It is significant that in no case did an observer become conscious of the rhythmic experience without experiencing either

[5] The writer has failed to find a sufficiently definite equivalent for the German *Takt;* and this term will be employed throughout to indicate the measure, or the rhythmic beats within the group.

actual or imaged movements. Not infrequently observers report a conviction that there are movements which could not be localized; in the case quoted above the observer thought she would not have detected the pull of the eyeball in rhythm had her eye not been hyperaesthetic. When actual movements were inhibited one of three things usually occurred. In some cases the rhythmic effect was decreased; in others a tendency to movement appeared in some other part of the body; or, again a motor image or a visual image served as a substitute for the actual movement. In one case after successively moving head, fingers, hand, foot and entire body to the rhythm the observer began to whistle (silently); he found that this action served vicariously for the others; when the whistling was inhibited the hand began again. Occasionally, also, an observer reported that the respiration followed the rhythm of the music; this however is not frequent or long continued since the rate of respiration is too slow for the rhythmic beat of the measure.

This bodily movement to the *Takt* is most evident while listening to compositions in which the rhythmic element is predominant as *e. g.*, the march or dance; and is again stronger in two or four *Takt* than in others. In the waltz often the first beat only is marked, though the second and third beats are frequently marked by individuals who perform music or who dance. In other compositions where the rhythm is less prominent, the motor reaction is usually only to the first accented member of the group or the larger movement of the phrase. The motor reaction to individual notes will be discussed later.

There is, of course, nothing novel in our discovery of a bodily reaction to rhythm. Parry has pointed out that to mediaeval composers rhythm represented physical action, the attribute of the physical body and was, therefore, secular. And while the earlier experimental investigators of rhythm were disposed to postulate a central rather than a peripheral theory of rhythm, most, if not all, of the more recent experimentalists hold that the perception of rhythm is completely dependent upon the presence of kinaesthesis. We do not feel justified in urging our results as a contribution to this general problem since in music there are other factors which cannot be dissociated from the pure rhythmic experience, *e. g.*, bodily reactions to changes in pitch and intensity, associations with march or dance, emotional factor, etc., not to mention the various factors long since pointed out by Meumann. However, our introspections do substantiate a further

distinction made by Meumann (65; 317-319), namely, the difference between the perception of rhythm and the perception of *Takt*. Three of our auditors were never aware of any *Takt* except that of march or waltz; they were always aware of rhythm. For these auditors rhythm is not objective, something in the music, it is subjective, a feeling of their own activity. On the other hand, those auditors who habitually listen to music intellectually always perceive *Takt* in addition to the perception of the rhythm.

b. Reactions to Larger Rhythms. Certain writers, Parry (27; 198ff.), Glyn (78; 192), Bolton (60; 22, 26), Wundt (73; 154), Riemann (28; 33ff.) and others, have discussed larger rhythms in music which are formed by the combining of several groups into a phrase, several phrases into a section or period, several sections or periods into a 'movement,' and finally several movements into a cycle. In the rhythmical idea also is seen the principle of 'contrast,' of 'variety in unity,' the laws of ternary and binary forms, the swing of the tonic harmony to dominant and back again. No attempts have been made to correlate any of these rhythms, except the phrase, with organic or muscular movements. These Riemann has attempted to correlate with respiration,— a correlation which, as we have seen (p. 252) we have been able to establish under certain conditions by an appeal to the kymographic records. We have also reported introspections from six of our eight observers who found larger muscular movements or images which corresponded not to the *Takt* rhythm but to a larger rhythm which we have identified as that of the musical phrases. It will be noticed that the typical experience was a motor image of swinging or swaying.

While it is quite possible that the musical phrases may be distinguished from one another by cadences, and therefore may be differentiated from one another, we are inclined to believe, after a careful study of all the evidence, that the feeling of these larger rhythms is conditioned either by actual movements or by kinaesthetic images. In fact, whenever a composer relies upon rhythm to produce a desired effect, the realization of that effect by the listener is dependent upon the appropriate motor reaction, either in the form of actual, implied or imaged movements.

c. Correlation between Muscular Movement and Tempo. The tempos of the various compositions employed in this experiment were kept absolutely constant; hence the effect of a change in tempo in successive reproductions of any one composition could not be observed. Occasionally, however,

an observer reported that a tempo seemed to be too fast. The reasons given in the introspections are as follows:

V. 'I followed the rapid little places (Herbert's Badinage) on my toes. In the slower parts I had a tendency to hold muscles with some suspense waiting for the rapid passages. The music did not please me because it was fatiguing to remain so long on my toes.' Again, 'I had strains all over the body in the first part. The rate was too quick for me; the time of the movement is too fast for me to react to. It is a delicate dance for a person too large, so I found it unpleasant.' Fs. 'I had motor imagery of waltzing, though the time was too fast for a good waltz.' S. 'When the music goes so fast, it is not particularly pleasant. There is a feeling that the performers will not be able to carry it through; that they will break down.'

The reaction of V. to the Badinage is of much interest in this connection. The composition, which may be characterized as an alternation of slow and rapid passages, was repeated after a month's interval. In both hearings her reaction was the same. At the close of her introspections, some questions were asked; they with their answers are as follows:

(Do you like fast dances?) Yes, if they are strong and vigorous, but I do not like little dainty fast dancing. (Do you think if you had imaged a fairy as making the rapid steps the music would have pleased you?) I think it would; to me the music was coquettish, I was not in that mood, I did not want to go fast.

All of the other observers enjoyed the rapid passages in this particular composition. One observer imaged young girls as making the movements; another visualized a flitting butterfly; still another 'vaguely projected the rapid little movements in space' (probably eye-movements). The reaction of another was vocal-motor.

In discussing the relation of heart-beat to tempo, we found that a number of authors had fallen upon the normal rate of heart-beat as the criterion between fastness and slowness. (See p. 253.) Since an appeal to the kymographic records shows an increase in the rate of heart-beat for all tempos, and since no correlation between tempos and concomitant rates of heart-beat could be found, we do not feel that this theory can be sustained. The introspections above show why, for some of our observers, the music was too fast. They are three: (1) The music was too fast for the particular motor reaction which seemed most natural for the observer; (2) The music was too fast to be danced; (3) The music seemed to be too rapid for the musicians. To these, other obvious reasons might be added. Musicians know that notes in diatonic succession (scale passages) may succeed one another more rapidly than the succession in larger intervals. This might well be

explained on a motor basis but it is possible that the inherent laws of pure melody may be a determining factor. Again there is the factor of contrast; a tempo of 80 may seem fast after a tempo of 60, or slow after a tempo of 120. Ebhard's experiments seem to show that the introduction either of an emotional element or of additional stimuli may cause the performer to quicken the tempo without being aware of the acceleration. And our experiments have shown that the auditor's judgment of the tempo is equally subject to variation. The human body is not equipped with a physiological metronome, by means of which tempos are estimated in any constant fashion. The only criterion of tempo which we employ is an indefinite 'sense of fitness' whose estimate may vary from time to time without any concomitant variation of heart-rate, of respiration or of other physiological process. And we estimate tempo in terms of our momentary ability to make that motor response which seems to be most fitting for the particular composition which constitutes our stimulus.

d. Correlations between Objective Movements suggested by the Music and Actual or Imaged Movements on the part of the Listener. Aside from the motor reactions which we have correlated with the various phenomena of rhythm, there are movements, or tendencies to movement, with each successive tone. The most frequent evidences of these are the mimetic movements of singing or playing. These, however, will be discussed in a later connection. Only those muscular movements which accompany each tone will be discussed here. The tendency noted above to follow the rapid places on the toes is a case in point. Another auditor says 'I anticipated to see whether the note would go up or down. I think there is a tendency to accompany this with the whole body; to ride with it.' 'I noticed that my eye brows went up when the music went up.' 'I got clear visual imagery of a stage, a motor image went up and down.' The visual imagery is full of such movements, the flitting of a butterfly, the various and intricate steps of dancers. We have above noted a case where the dancers jumped at a sudden rise in pitch of the music. On another occasion the same observer said, 'Two Gipsy girls were dancing, making very rapid movements, like flying.'

In our review of the literature we noted the experiments of Féré (94), Tarchanoff (119) and Scripture (118), which seemed to show a correlation between changes in pitch and contraction in muscle. This correlation seems to be generally accepted. Our introspections serve only to show how consciousness is affected by these muscular contractions. Gurney

(23; 140) raises the objection that the succession of sounds in music is often so rapid that a muscular reaction to each sound is impossible. The motor reaction, however, does not imply a complete contraction and relaxation for each sound, but only a partial contraction or relaxation. For example, in an ascending scale passage the contraction might continue from the lowest to the highest note. The apparatus used in our experiment was not devised to record these muscular movements so that we cannot present any objective data concerning them. From a study of the introspections we are forced to the conclusion that whenever musical movement becomes objectified some corresponding muscular movement takes place in the body of the listener. We are of the opinion that eye-movements function largely in the result. The following introspections have a bearing on this general problem:

Pitch.—Fn. says: 'I localize the up and down of music in space; this without visual imagery—it is manual-motor. V. says: 'My first impression of a low note is that it is away off to the left, high note to the right. If a note is prolonged it changes its position in space perpendicularly. When the dentist is working on my teeth there are two kinds of pain—one front, one back. The former has often been associated with me as a high, shrill note, the latter as a low bass note. Yesterday, I bit on something that brought up the back pain; immediately the idea of the bass note came—the auditory image first, then the visual image of the key board.' This she thinks may have come from a childhood association; when suffering with neuralgia her cousin tormented her by thumping on the piano. S. says: 'When music goes up and down, it seems like a stairway. When it goes down three or four notes in succession, I seem to be swinging with it in steps. I think I remember music in that way.' C. says: ' Near the end, I anticipated the notes ahead; it may have been partly auditory but I think it may have been a fusion of auditory-motor. May have been visual—a feeling of steps in two dimensions of space.' R. says: 'When the note went high, a girl who was standing in the middle of the room suddenly raised her arms up high.' (This a visual image.)*

The case of S. which is cited above is of particular interest. At the close of the experiment he drew diagrams of ascending and descending scales. These were ascending and descending steps; the width of each step is relatively determined by the duration of each tone. These steps are localized in space in purely motor fashion but without any visual imagery. His report that his memory of music is of exclusively motor-spatial character suggests a similar case which has been cited by Wallaschek (127; 126). Squire (69;

*The reader will observe that certain of these spatial localizations which are here discussed under the general heading of motor imagery are visual and not motor: for reasons of economy of space it has seemed wise to discuss spatial localization of whatever sort at this point.

558) reports introspections wholly analogous with ours. "The associations were very frequently of a spatial character; high was 'nearer,' low was 'further away.' Low was 'big' and high was 'thin.' One subject spoke of the high tone as a 'silly little appendage,' another placed the high tone in the top of the head, the other at the base of the skull, and experienced a flipping from the one position to the other as the tone changed." These introspections are quoted here to show that, whether or not from associations, some individuals do objectify tones of varying pitch in space.

The question has often been raised as to the reason why pitches are designated as high and low. The answers are many and varied. This peculiar mode of designating pitches has been referred to the corresponding degrees of tenseness of muscle (Sully, 33, 272; Steinitzer, 19, 18; Combarieu, 20, 128); to corresponding regions of the human body (Goblot, 136); to corresponding positions on the musical staff (Souriau, 18, 305); to corresponding differences of mass, weight and volume (Gurney, 23, 140); to corresponding differences of quality (Stumpf, 50, 189ff.); and to a purely arbitrary origin (Bellermann, See 18, 19). The introspections of our observers show that tones are ordinarily externalized and localized in space, that they are assigned to high or low altitudes in space corresponding to their high or low pitches, and that this process of externalization and localization is characterized by its immediacy and unreflectiveness. This perception usually assumed a graphic form (manual-motor) or a stairway form (visual; pedal-motor). But our auditors have thrown no light upon the means by which they came to perceive pitches in this fashion.

Musicians have themselves recognized the intimate relation between movement and music. They have stated that their art is concerned with rest and motion,—or, as Riemann (28; 1) puts it, with rest, motion and rest. Köstlin, quoted by Gross (8; 21f.), states that music glides, turns, hops, leaps, jumps, dances, sways, quivers, blusters, and storms, and adds that the auditor who adequately reproduced its movements in the physical world must become imponderable or he would be dashed to pieces. But, as Gurney has pointed out, the essential characteristic of music is an 'ideal motion,' not a physical movement. It is evident that the term 'motion' is here employed in two senses, the one objective, spatial; the other subjective; but both depend primarily upon the same factors, —changes in pitch, intensity, duration, and rhythm. The 'ideal motion' of Gurney seems to be a product of two factors,— a motion due to expectation and satisfaction, and a movement of feeling (see pp. 279ff); and this conception of music may be a purely auditory experience without any objective reference. Our introspections show, however, that for certain individuals the ideal motion is objectified and ex-

ternalized. The music arouses bodily movements corresponding to changes in pitch, intensity, speed, and rhythm; and it is the bodily movements which, we are convinced, are in turn objectified.

e. Other Mimetic Movements. In addition to the sorts of motor reaction which we have described, there are other tendencies to movement which are not directly connected with the rhythmic or other movement factors which are inherent in the music itself. The first of these is the tendency to hum, to sing or to whistle the melody. This reaction to the music gives expression in some instances to pent-up feeling; it is analogous with an audience's expression of its enthusiasm by means of applause.

Fn. 'When the cello came, I had to vocalize; no noise, but felt a strain.' 'I found my throat moving, singing the music. I felt the strain there.' Fs. 'I had a tendency to sing at times, a weak innervation.' 'I had a clear vocal-motor image of singing with her, a tendency to smile with pleasure.' H. 'I wanted to sing the melody. I thought I could not sing the high notes, so dropped to the baritone.' 'Head, arms, legs, fingers, all my body got into it. Soon I began to whistle the tune; this required more attention and legs, arms, etc., stopped as if satisfied.' 'At one time it attracted me enough to make me whistle.' 'I always want to whistle or to sing, no matter what the music. I enjoy music more out of doors than inside because I can sing and whistle.' V. 'In one place I felt my tongue move as if I were going to sing the music.'

This motor reaction appears in another form in those observers who play some instrument. They feel their arms or fingers make the playing movements.

Fn. 'I caught myself bowing my violin with the music.' 'I could feel the pull of the bow, the fingers moving.' 'I felt as if I were trying to play it myself.' Fs. 'I found that my left hand was executing the movements of the right hand playing; kinaesthetic image of playing the violin; the left hand bowed at times.' 'I had a motor image of playing; I could feel the glides and tremulo vividly. I felt as though I were playing the accompaniment on the piano, and trying to keep in unison with the orchestra.' 'I had innervations of playing, in my left hand; I was not aware of my right hand.' 'At low notes I felt myself playing; I knew that they were difficult to play.'

In the introspections of Fs., the images of playing were always confined to the left hand; they were never referred to the right hand, which was in the plethysmograph. In one case, her left hand played the treble part of the keyboard, which ordinarily would fall to the lot of the right, and yet the introspections show that she was not conscious of her right hand; *i. e.*, this interesting phenomenon seems to be a product of *Einstellung;* there was no trace of a conscious

and voluntary inhibition of right-hand movements, or of conscious and voluntary transfer of these motor images or incipient innervations from the appropriate but imprisoned right arm to the inappropriate but free left arm.

The introspections of certain observers reveal the presence of involuntary movements, which apparently are connected neither with the movement of the music nor with mimetic expression, but were more like muscular twitchings which the observer could easily inhibit. The plethysmographic tracings of two observers revealed involuntary movements of which the observers were not conscious.

f. Motor Phenomena of Expectation and Satisfaction. Invariably our observers, reported respiratory and other motor concomitants of expectation and satisfaction. It is probable that expectation is present more frequently, though in a less degree, in the case of the hearer who follows the music analytically; but it is also found in the case of those auditors who listen more passively. So long as the rhythmic or melodic flow is uninterrupted, the attention of the hearer tends to be more passive. But if the rhythmic flow is interrupted, if a sudden dissonance enters, if a 'pause' or cadenza is inserted, attention at once becomes alert; and those bodily processes which are under voluntary control are instantly arrested. When the melodic movement recurs, both the mental and bodily processes flow on again. The same phenomena of interruptions and resumptions frequently accompany the hearing of the final cadence of the composition.

Fn. 'I enjoyed the flute cadenza; a feeling of suspense; I felt my whole organism pausing for a moment; the normal flow began again after the first note of the cadenza.' 'The expectancy contained, as one of its components, an auditory image of the forthcoming chord; this has happened frequently but with different degrees of clearness.' Fs. 'I held my breath, and turned my head to listen better.' 'I was aware of holding my breath just before the last movement where the cello holds.' 'Visual image of theatre just before the curtain goes up, —expectation. I was in the orchestra; as the intensity of the music increased, I could see pianist and conductor; saw the lamp flash for the curtain; my feeling of expectation was strong. I think this was due to the music itself, but I am not sure as to how much belonged to the music and how much to the image.' 'Tension throughout; it was hard to localize; lips were parted; felt a tendency to smile; a feeling of stilted breathing; close attention in the long cadenza; held my breath; a feeling of expectancy.' 'There was a feeling of climax about the middle where the six major chords merge into the four minor chords; decided expectancy with intensive tension.' 'A feeling that the end of the phrase was coming. This was partly due to familiarity; slight tension gathered with the phrase: a vocal motor of 'wha—' (what) accompanied by slight facial tension. This was the way in which the question, in the expectancy, presented itself.' H. 'With the

holds, I held, and I pulled up to them.' V. 'Noticed a tendency to keep time with the foot but my foot stopped when the music held; I noticed a tension as we approached the final cadence.'

The following introspections are cited to throw light upon the basis and the constitution of the experience of expectation; many others of analogous import could be added.

Fn. 'I knew the end was coming; thought it was fine; it let me down so easily.' (How did you know the end was coming?) 'From the characteristic sequence of tones. It may be due in part to a memory of other compositions. I cannot always predict; it sometimes stops abruptly.' 'I knew the end was coming; when I heard the *sol*, I knew that the *do* was coming. When the music stopped, I was very quiet and restful and satisfied.' 'After the music, it was quiet, as if the storm had blown over and now all was still.' Fs. 'I knew the music was coming to an end, though I did not look forward to what was coming next.' 'Just before the end, I felt it coming; tensions in my face, foot, heel and toe; my toe would go down on tensions.' 'After the music stopped, an all-is-over feeling as when the curtain goes down; possibly slight relaxation.' 'Was conscious that the music was working up to climax, but I did not work up with it. After the music stopped, I found that I was not tensed in any degree, I could not relax further; the music had scarcely impressed me.' 'Strong feeling of the ending, with regret, because I felt that 'just around the corner' I might recognize it.' (Did you know that the music was coming to an end?) 'Yes.' (How did you know it?) 'There are several stereotyped endings which one can recognize.' V. (Did you know that the music was coming to an end?) 'Yes.' (How did you know?) 'There are certain chords, progressions, that often end compositions.' C. 'I felt that the end was coming; my eye-brows went up; a vague sensation of strain; the sound was in the focal point, the strain in the fringe.' 'At one place I thought the music would cease; I was all attention; thought it would stop; then came a pause—and a feeling of uncertainty; then the music went on again. After this, I felt a settling down as before; a change in muscular feel. When music stops abruptly, I seem to come down with a thud; as it approaches a climax, I rise with it; I get more tense, and then I drop.'

These introspections make no new contribution to the psychology of expectation. They do show however that the experience of expectation is an essential component of musical enjoyment; and they furnish a general confirmation of the recent results which have been yielded from an analytical study of the experience of expectation. The bodily attitude is analogous or identical with that of attention; attention to a mental content is, however, usually lacking. The experience is describable rather as an anticipation, a suspense, or a waiting for what is to come. The attitude assumes different forms and contains different components, in different individuals. In certain individuals the essential content was verbal motor,—an incipient tendency to ask: 'Wha— (what)?' and the like.

Other observers report visual images of persons in an expectant attitude. Others, an auditory image of the expected tones or chords.

D. Reactions to Descriptive Music

As has been indicated in our summary of the literature, musicians and aestheticians in general have frequently concerned themselves with this question: To what extent may musical compositions be employed as a vehicle for communication and expression? Can the composer or conductor hope by means of his art to convey a definite idea, such as a story or the description of an incident, to his auditor?

We attempted to throw light upon this problem by means of a 'descriptive' composition. This descriptive selection (*Voelker*, Hunt in the Black Forest) was an orchestral record. The program or legend which was supplied by the publishers indicated that the selection portrayed the following incidents: the break of day; the birds sing in the forest; chanticleer's voice; the huntsman's horn; the village chimes are heard; the hunters assemble; they start in full gallop; the horns sound the halt; at the forest blacksmith shop; the smith at work; they start again; the hounds scent the game; in full cry; the game is run to earth; cheers; *finale*. The title of the selection and the descriptive legend were of course withheld from the auditors; they were simply asked to listen to the music and subsequently to report their experiences. The following are the introspections.

Fn. "At the outset I concluded that it was a 'barn-yard' selection; then I paid no attention to it although I heard the sounds throughout. I wondered how they make the dog bark. Toward the end, I began to analyze; and from there on I rather enjoyed it."

V. "I was puzzled to know what it was all about at first; I thought it was the opening chorus of 'Woodland' (a popular musical comedy). I had a visual image of a stage with the sun coming up; Chanticleer and the birds coming together in chorus; there was much movement and streams of light quivered when the sun came up. Then I went to the circus; this occurred when I decided that it was not 'Woodland.' I saw a saw-dust ring. When the anvil sounded, I saw some object flying around the ring; at the stroke of the anvil this object was in the fovea. It was like swinging a chestnut around on a string; the entire circle you see, but at one place it seems to be more clear; and this place seems to give the impetus for continuing the movement. I noticed a number of animals. After I had seen the animals, etc., I was aware of a muscular tension in my right arm; I tried to relax it slowly. Just before the music ended all the people got up and crowded out; dogs appeared in the distance. Attention was more active than usual; more attention and less mood than in the other experiments. At the instant when the shout came, the audience were rising from their seats. No effort whatever was required to bring up this picture; it just came. I saw horses and dogs running around the ring. It was a circus, and one place was like a galloping horse. The bell (village chimes) in the beginning disturbed and confused me. I inferred that the sun must be going down. It ought to be evening but the sun was not going down; it was coming up; it may have been the twittering birds that suggested the sunrise. The opening scene of 'Woodland' depicted an evening setting. There was something about the crowd and confusion that may have accounted for the tension in the right arm."

Fs. "In the fore-period, I was conscious of intense anticipation. When I heard the cuckoo, it aroused a visual image of a cuckoo clock and a cuckoo whistle; also of a bugle. The minor music aroused an image of Indians; a cheap stage; Indians stealing about the stage; a sensational mock-murder; a fierce grin as if they enjoyed it. Then a moving picture image of Indians. Something sounded familiar; much excitement; the Indians entered again in a row, but instead of coming through the wings they entered from an incline so that I could see first the head, then the shoulders; they had the same fierce grinning expression on their faces; they shook hands in time to the music, lifted their knees high and stamped. A feeling of amusement such as I have had in a badly played melodrama. Visual image of a group of men waving their hats; also men standing above, selling stocks. I never saw a stock exchange, but I was much excited; I could see the excited faces. Suddenly it turned into an auction sale. This was followed by a motor image of a dance where the bones were used in the music. I distinguished the barking of the dogs, around the auction sale; there was still much excitement. As I realized the end was coming, attention decreased rapidly; there was no pleasure as before; I enjoyed it in a totally different way. There was 'something doing' every minute throughout the selection; excitement, complex of muscular strains, verbal imagery, New York Stock Exchange, and a very weak vocal-motor innervation of 'New ——,' a verbal image of Bernhardt. (Did you notice the rooster crowing?) Yes; and a vocal image of the word 'rooster.' (Did you notice the church bell?) Yes, decidedly; and had a visual image of a church tower. Toward the last I wondered about the instruments used:—'How in the world did they produce that effect?'—a faint verbal image. After the music stopped the barking dogs made me think of a vaudeville performance which I saw during the vacation; I was bored then and I felt bored here. That feeling vanished with the image; then I smiled and laughed aloud at the ludicrousness of it all."

W. "In the fore-period, I held my breath for a long time. I saw the gypsy scene in Carmen. It was dawn; when the bird calls came, I thought of a comic opera called 'Woodland,' in which the actors were all birds. I recalled one of the duets, 'Between a Cold Bottle and a Hot Bird;' then thought of Rostand's Chanticleer and wondered if it were like Woodland. I then went back to Carmen, where the stage fills up from the cigarette factory. I had all sorts of motor sensations in my hands, feet, legs, everywhere. There was a queer racket in one place like rolling a hollow box; this took me to an amusement park, on the Coney Island order, where I saw all the shows, etc., particularly 'Shoot the Chutes.' Then the dogs came in, and I went to the circus; there were three rings—trained dogs, horseback riders, etc., —a complete mix-up until the end, with tendencies to move throughout. I saw clowns in all sorts of costumes and it was they who did the shouting at the end (cheers of huntsmen in *finale*); I also saw riding-masters whipping their horses. The dogs made me think of the blood-hounds chasing Eliza in Uncle Tom's Cabin. In my opera picture, no one spoke or sang,—people just moved about on the stage."

R. "When the music first began, I got a picture of a *Plärrer Messe* —'shows' of all kinds. In the distance, a church-bell was ringing. Music was playing at one of the 'shows' where the details of a murder were being exhibited; 'spielers' were talking; while moving about, I saw a menagerie and as I passed by I saw snakes, lions and dogs. The bells were still ringing outside; all music stopped except that of

the merry-go-round. I saw a riding school; two men in front noisily announcing their attraction; I went in; there was only a little music. I then went into the menagerie; I saw a woman in light blue velvet who was performing with the lions; she put a ribbon around their necks; then suddenly ran, the lions after her, but she got out. A big dog, always barking, came out and ran about; a man tried to catch him but never succeeded. The chase was amusing. In one place, he nearly caught the dog and everybody yelled; but the dog got away and then everybody laughed."

H. "I could not understand what the music meant; I thought the melody was very queer; I wondered if it were Oriental because there was no rhythm. Then it fell into rhythm, and I realized that it was a descriptive selection. I concluded that somebody was making all this noise intentionally. Just before the dogs began to bark, I realized that it was a hunt. Once in a while, amid all the noise, I could hear the band like a tin pan; however the dogs made so much noise that one could not hear the music well. I lost interest; finally when it stopped, I said 'Bah, any band can do that.' One place attracted me enough to make me whistle for a time. I had some visual imagery of men on horseback galloping over the fields with dogs; of a tally-ho also, with a cheap band down to start them off. It was slightly amusing but it did not appeal to me favorably as a musical composition. It occurred to me that many people would like such mediocre stuff."

S. "The music came gradually and there was more visual imagery than usual. Near the beginning of the selection there were a number of whistled notes (probably suggested by the twittering of the birds). I saw the mouth of the person who was whistling. I heard the tramping of horses, and had a visual image of horses trotting toward me. I felt the increasing tenseness; then as my visual picture disappeared, it seemed to get smaller and smaller,—this because the music became less clear. The noise and din which represented a battle brought some excitement; and I also felt excitement when the horses came trotting up. The images of the battle were more like a picture; the armies were standing, but individuals were moving; near the end, one detachment of the army was falling back. (Did you hear the rooster?) No. (The bells?) Yes, I saw bells, silver bells. (Did you hear a dog barking?) No. (Did you hear any shouting?) Yes. (Did you have an image of it?) Yes, I saw a flag and around it a group of men who were waving their arms. (Did you hear the bugle?) Yes. (Did you notice any tendency to move your body?) No. (Were you conscious of any of that 'dragged feeling' which you reported on former occasions?) No; I followed the picture all the way through. (Can you account for the fact that there were more visual images to-day?) The music was more descriptive. (Why do you say that it was more descriptive?) Some music calls up a scene,—some does not. This does. Perhaps the bugle and the bells helped to bring it; they were fleeting; but the moment I heard the horses, I saw cavalry coming."

A survey of these introspections reveals an enormous individual variation in the mental contents of the several auditors. It is true that several of the introspective descriptions contain elements in common: an outdoor scene; songs of birds; animals; the dawning day; rapid and vigorous action, and the like; but the setting or story into which these elements are interwoven shows a marked difference from in-

dividual to individual. One auditor conceived the music to be a portrayal of a battle; another, of a circus; another, of a melodrama; another, of a hunting scene. It is a remarkable fact that even the purely mimetic descriptions, such as the barking of the dogs, wholly failed in certain instances to arouse situations such as the composer and the conductor had hoped to simulate.

These introspections show that the composer is powerless to evoke any one definite mental picture in the minds of all of his auditors. Music is unquestionably adequate to the task of suggesting definite and particular emotions; and without having recourse to a legend printed upon a program it may even on occasion convey certain ideas and characteristics provided they be of a wholly general sort. But even here neither composer not conductor can hope, without extrinsic aid, to attain any high degree of definiteness or community in the mental content of the several auditors. Clues to a general situation may be contributed through the medium of tonal imitation, of rhythmic suggestion, and the like; but the associations and the constellations to which these clues give rise are, in great measure, beyond the control of the musical stimulus. Music *per se* is able to give definite expression to no more than activity, storm and stress, varying moods of plot and scene.

E. Emotions and Moods

The emotions which were reported by our observers were of varied nature and of varied origin. In not a single instance was an intensive or a long-continued unpleasantness reported,—a fact which may have been due to our choice of selections, and to the temperaments of our observers. It is a remarkable fact that when a selection failed to arouse pleasantness of any sort in any degree, it became so uninteresting that the auditor's attention wandered to other topics. For instance, the descriptive selection failed to appeal to Fn.; his wandering attention was recalled only when the loud barking of the dogs was heard. And even here his attitude was characterized not by such emotions as music ordinarily arouses, but by a query as to how the imitation was accomplished. The same phenomenon of inattention was reported whenever unpleasantness made its appearance, even if for only a moment. The sources from which musical enjoyment is derivable are so multifarious that one is not surprised to find that indifference and unpleasantness have been so rare and exceptional.

The tones of musical instruments, even when presented in isolation, have a distinct hedonic quality. And in numerous instances our observers reported a sheer delight in the timbre of particular instruments. Chords, resolutions of chords, nuances of tones, and the like, were also sources of enjoyment. To these may be added the characteristic motor reactions to rhythms, to runs and turns, to abrupt contrasts of pitch. The mimetic reactions, such as humming, singing, whistling, beating time, playing the violin, piano, etc., which characterized the procedure of several observers, were also found to be distinctly pleasurable in many instances. Those observers who reported a vivid play of visual imagery frequently testified that they derived keen enjoyment from being spectators of these kaleidoscopic changes. When compositions are so familiar as to be already endowed with a wealth of associative supplementations, these associations may themselves contribute their quota to musical enjoyment,—apart from the fact that this very familiarity enables the auditor to enhance his enjoyment by a successful prediction of how the theme is about to unfold. The various sorts of intellectual appreciation give rise to an enjoyment of their own. For instance, the skilled violinist or pianist derives a peculiar pleasure from a display of skill and technique upon one of these instruments; similarly, the auditor who is trained in the technicalities of musical composition appreciates and enjoys the ingenuity and skill which is manifested in the work of the composer. To these must be added the pleasurable emotion which is derived from an idealistic or symbolic interpretation of musical compositions. Two other factors, which we shall call mood, and excitement-repose, are so exceedingly significant for musical enjoyment that a more detailed treatment will be accorded to them later.

Fn. 'I like the E flat cornet when it enters high in pitch; it is a fine spot.' 'Enjoyed every *crescendo*, the nuances were brought out so well.' H. 'I noticed that the music was a cello solo with piano accompaniment; enjoyed the richness of the tones, the high notes of the piano were so clear, felt intellectually that the music was of high order.' Fs. 'The harmony of the first movement was pure pleasantness. No mood. I also enjoyed the tone quality of the oboes.' 'Two long notes in the introduction were decidedly pleasant, they were so exquisitely played.'

V. 'Felt as if I were on the shore watching some reed or plant rise and fall on the water; a vague and dreamy pleasure.' 'The rhythm was so irregular it interfered with my pleasure, I could not dream as I wanted to.' R. 'I never heard the music before but it was beautiful and the dance (visual image) was beautiful. I enjoyed the figures of the dance very much.'

Fn. 'In the fore-period, I recognized it by name and thought it was fine.' 'I used to sing it in the glee club; this morning I tried to sing it but could not recall the words. The boys and the accompanist came as a visual image,—all this during the first two strains. The reaction was essentially emotional, such as old friends bring up when you meet them again.' 'Degree of attention was about that which is usually present when one hears a new composition. I was passive,—a good deal of it escaped me; I could not follow it as I would a familiar selection.' 'My memory of the music gives me an additional pleasure. I analyzed, anticipated phrases, but I knew the selection and did not have to work.' 'The composition was new, I found that it required an effort.' Fs. 'The music came and was immediately recognized. I play it. It was distinctly pleasant; I had a feeling of being master of the situation because I knew what was coming.' C. 'I always enjoy music better after I have heard it. Occasionally, if it is decidedly lyric, I enjoy it as much at first.'

Fn. 'Where the notes are highest and most intensive, I have a feeling of excitement which subsides as the pitch and intensity fall. This has pleasantness as a background.' 'While listening I began to get excited, just as though I was getting ready to laugh; there wasn't any fun in it, just pleasurable.'

Fs. 'I felt a thrill, a decided tendency to smile. There was a slight intake of breath, a tendency to lean forward—a sudden welling up of pleasantness, which suddenly subsided.' Again, 'There was a suspension of rhythm in listening to the cadenza; this was very enjoyable,—accompanied first by decided attention, then relaxation. After this the rhythm came in again.' V. 'Near the end where the heavy chords came I thought of a triumphal anthem, I went along with it.' 'It was exultant, I had a sense of buoyancy, of well-being, my chest felt inflated; I had no tendency to move, but a sense of well-being.'

We have already referred to what seemed to be a movement of feeling, a rise and fall, or an ebb and flow in some such dimension as excitement-repose. The most complete introspections were in consequence of the special instruction to 'attend to the phrases,' though these waves of feeling were reported independently in numerous instances.

Fn. 'The music seemed to be rolling throughout; it worked up to the high notes, then came down not only in pitch but in intensity. Ascending, all is energy; I feel it go up, feel it come down; my own feeling waxes and wanes. This is pleasurable throughout but more than that.' 'I let myself go with the movement and found it more emotional as it went up and down. I got into it on the downward movement. By 'getting into it' I mean I felt it myself. I noticed much kinaesthesis; had sensation in my right arm of moving downward; my arm was quiet but I imaged it as moving down to the right,—moving to a position of rest, accompanied by relaxation. In one instance where a phrase was repeated a third time, I felt the greatest excitement accompanied by a thrill; then the excitement came down to repose. I think 'excitement-repose' would be good terms to express the poles of this feeling. I anticipate the climax before it actually comes and I pull up to it. The excitement is accompanied by some sort of tension; I think I often image this kinaesthesis; at least, I am unaware of actual contraction.'

W. 'There is a decided rise and fall of affective tone; it rose with the climax of the phrase. When the next phrase began there was not so much tenseness. That queer elusive feeling of myself swaying was present about the middle of the composition. At times I seemed to be humming; once I was aware that I was breathing up with the climax of the phrase, and would then start down with it.' 'The rise and fall in feeling was correlated with muscular tension and relaxation. My breathing seemed to be sending the bow (of the violin) up as if the rise in breath was actually motivating the music. I also noticed vague muscular sensations in my limbs, arms, all over the body. Coming down there is a release of tension, a sinking into quiescence; but complete repose is not reached until the end of the composition where there is also a diffused feeling of general satisfaction.'

Fs. 'I noticed slight tension gathering with each phrase; and then, though not always, a relief,—a relaxation at the end of the phrase. I tried to fit up a meaning to the phrases which seemed to be in narrative form; the first phrase makes a statement, the second amplifies, the third is almost the same as the first but with additions. This works up to a climax, with increasing but faint tension. There is relief from tension at the end. I did not experience any emotion in it.'

For the sake of clearness in analysis and discussion we venture to construct, with the aid of the introspections, a general statement or outline of this experience of excitement-repose. Supposing the feeling to be coincident with the beginning of the first phrase, the feeling in the direction of excitement follows the rise in pitch and intensity of the melody, until the end, where the feeling is suspended, *i. e.*, complete rest is not attained and expectation enters. Coincident with the beginning of the second phrase there is first a diffused feeling of satisfaction, and the feeling curve following the melodic outline may be, often is, in contrast to that of the first phrase. At the end of this phrase the feeling more nearly approaches rest; but since it does not reach complete rest, expectation again enters followed by satisfaction at the beginning of the third phrase. Here the feeling curve is often similar to that of the first phrase but of greater intensity, again following the melodic outline which, in this case, rises to higher pitch and greater intensity. Thus we find a recurrent rise and fall in feeling not only in each phrase, but also a larger curve corresponding to successive phrases. This larger curve reaches its highest point at the climax of the movement or composition, after which the melody ultimately returns to the key-note, and complete rest or repose and satisfaction are attained. It is evident that any number of variations of the above periodicity are possible. If now the reader will bear in mind this general outline he will find that the following analysis conforms with the schema and becomes more readily intelligible.

The part played by expectation and satisfaction in the rise and fall of feeling is difficult of analysis. In some cases it seems clear that the degree of expectancy is conditioned, in part at least, by the degree of feeling. In other cases both expectation and satisfaction are present when the rise and fall of feeling is not present, or as the auditor quoted above says: 'There is no emotion in it.' We are of the opinion that the expectancy here is in great measure analogous with attention, and that the degree of expectancy is coincident with

the degree of interest. On the musical side, two forces are at work in the development of the feeling; changes in pitch, speed and intensity; and the effect of tonal relationships. The sinking back to repose is largely due to the return in the direction of the tonic; and expectation is aroused through a temporary break in this movement; but the particular feeling of repose with which we are here concerned is not due solely to the satisfaction of the return to the key note. The difference is clearly seen when the music ends, with a rising cadence, on a tonic of high pitch. Here is felt the satisfaction of having attained the end but with enthusiasm or excitement.

It is also evident from the introspections quoted above that, on the bodily side, the rise and fall of feeling are correlated with muscular tension and relaxation, not only in the muscles of the extremities, but also in the respiratory muscles. The kymographic tracings of the respiration show unmistakably that when attention is directed to the phrasing the respiration follows the phrases. But these modifications in the general musculature accompany expectation and satisfaction when no other emotion than pleasantness is felt. It is impossible, therefore, to say that excitement-repose is conditioned solely by muscular processes.

The most important condition for the origination of this feeling is contained in the attitude of the observer. The following introspection represents a fairly successful attempt to describe the situation. 'The feeling is due to my own activity; I live the music; it becomes identified with myself; I forget everything outside; the music becomes the expression of my own feeling; it is only when I reflect that I objectify the music.' Numerous similar citations from the introspections might be added. It is this empathy that gives significance to the mimetic movements of singing, playing, and conducting, marching and dancing, of the apparent motivation of the music by the respiration, etc. All of these movements may be present in the body of the observer and no emotion result. It is only when the auditor feels himself into the situation, identifies himself with the music, allows it to become the expression of his own activity, that the emotion appears.

In our description of this feeling as of the dimension excitement-repose we have been guided principally by the reports of three of our observers who were asked repeatedly to analyze the experiences. The Wundtian theory was known to all of our auditors, although none have been able to accept

it. They did not know that Wundt has said that tones usually bring out affective processes of the two dimensions, pleasantness-unpleasantness and excitement-depression. Yet in attempting the analysis of this feeling, the Wundtian terminology occurred to one observer, and two others were asked whether excitement-depression would describe their experience. All agree,—and independently,—in substituting 'rest' or 'repose' for 'depression.' . Two agree in accepting the term 'excitement'; one says 'It is not unlike the excitement in a game.' Another says 'It is the same feeling that you have when you want to throw up your hat.' All believe that it is generically the same as the pent-up feeling that demands expression in applause, shouting, cheering, singing and the like. One observer believes that it is the feeling one has in listening to a fine orator as he reaches his climax. Other expressions have been used, such as 'fervor,' 'interest,' 'enthusiasm,' 'a feeling of activity,' etc.

All observers agree in reporting that these waves of feeling are pleasant throughout. They were asked, in a special instruction, to correlate the curve of pleasantness-unpleasantness with that of excitement-repose. One observer reported that, at the beginning, the curve of pleasantness rises with that of excitement; but when excitement falls in the direction of repose, the pleasantness curve remains practically stationary. In other words, so far as he was able to introspect, the feeling in the direction of repose was equally pleasant with that of excitement. In one instance, there was a rise in pleasantness due to the timbre, in another, to an attractive variation of the theme. The writer is convinced that the feelings cannot be arranged into a one-dimensional series without doing violence to the facts. Our introspective evidence justifies the conclusion that the feelings arrange themselves between two pairs of poles in two dimensions of space. One of these pairs can best be described as pleasantness-unpleasantness. The other pair is more difficult to definitize and to describe; the most appropriate terms for this pair seem to be excitement-repose.*

The emotional experiences which our observers reported are to be characterized rather as moods than as emotions in

* Titchener (*Phil. Stud.* XX., 1902, 404f.), Orth (Gefühl und Bewusstseinslage; Berlin, 1903. 66.) and others advocate the view that all of the simple feelings will be arranged in a one-dimensional series, —pleasantness-unpleasantness. In addition to these primary feelings, however, they recognize the existence of active or exciting, and passive or calming (depressing) pleasantness-unpleasantness.

the ordinary sense of the term. While it is true that the conscious content of the mood is similar to that of the emotion, yet the temporal course and life-history of the former is different from that of the latter. The emotion is temporary and evanescent; the mood is relatively permanent and stable. Emotions were by no means lacking, of course, but since they were, in the nature of the case, transient and fluent, they seemed, to the observers, to constitute a less significant part of the emotive experience. Nor were the moods wholly constant and unchanging throughout their temporal course. For while it frequently happened that an observer began his sitting with a definite mood upon him, and while he frequently felt that he was incapable of ridding himself of his mood,—which in numerous instances he found to militate against the enjoyment of such musical compositions as did not conform with the character of the mood,—yet it was characteristic of the mood itself that it was subject to transformation. Nothing is more patent from our observations than the fact that the character of the mood varies with variations in the character of the musical stimulus. For instance, so long as the musical composition continued to be made up essentially of strongly accented rhythms, of notes of short duration or of moderate or high pitch, of chords in major keys, the mood continued to be cheerful, happy and gay. But so soon as weak rhythms, sustained notes, notes of relatively low pitch, chords in minor keys are introduced, the mood becomes more or less sad, serious, sombre. And this new mood persisted so long as the music progressed in essentially unaltered character.

It seems impossible from the data at hand to furnish a systematic classification of the moods which were experienced, as the reader will observe from the following list of descriptive terms which were most frequently found in our introspections: happy, gay, lively, joyous, cheerful, exhilarating, playful, restful, soothing, tender, quiet, peaceful, coquettish, triumphant, sad, sombre, yearning, serious, longing, disquieting, restless, unhappy, weird, pensive, mournful, despairing, cheerless.

Fn. 'It was like getting out in a summer's breeze, when you feel like throwing your hat into the air.' Fs. 'The mood was a weird and mysterious longing for something. A mood not of sadness, but inclining toward sadness. I did not know what.' 'There was a feeling of general melancholy meditation. This was not an emotion but a mood, long drawn out.' 'In addition to this was the mood: mock seriousness, the life of a butterfly; all this is emotive, but it is diffused.' 'About the middle there was a mood, a weird sort of a feeling like that aroused on hearing a ghost story; it was decidedly pleasant.' 'The rapidity of the motion overcame a tendency of the chords to sadness. A new

mood came in, due to a tendency to a compromise between the graceful movement and the harmony. The movement was joyous, the chords were sad.'

W. 'This composition would make a lovely lullaby, the swing, the evenness of tone; it is soothing; one has a tendency to become drowsy.' 'The melody has a plaintive tone, a mournful something; the affective tone is sad.' V. 'Toward the close, the affective tone became more marked; the mood which would come on such a night came over me; this was not so strong as melancholy,—pensive, rather. It was not connected with any event, time or place.' 'The effect was very soothing.' 'The mood was pensive, softened,—not unhappy, brooding.' Again, after describing a visual image of a triumphant Roman procession. 'I did not feel the triumph, but I felt a solemn thanksgiving; it was not exultant.' H.H 'A mood of day-dreaming, sort of sadness, a man disappointed in love, or some such thing.' S. 'It made me feel sad, not unpleasant, but calm, quiescent, a feeling of revery.'

The question very naturally arises as to whether the same composition induces the same mood in different individuals. In certain introspections (analytical or intellectual) a mood was not always reported, so that comparison is not always possible. In one of the preliminary experiments the question: 'Did the composition give rise to a mood, and if so, what was it?' was asked after each experiment. The names of the compositions and the answers received are here appended.

Hexentanz, *MacDowell.* The contrast section of this composition was wholly different in character from the first section, which induced the dominant mood. Occasionally only a dominant mood was reported for the reason that this mood persisted throughout the contrast section; at other times two moods were present. The replies of the eight auditors follow: (1) happy; ominous; (2) joyous; (3) joyous and happy; (4) spirit of play; (5) joyous, coquettish, abandon; (6) joyous, at times rising to ectasy; (7) happy; melancholy; (8) joyous abandon; mystery; riot of pure joy.

Étude, *Chopin.* (1) passionate, but under control; (2) like certain Tennyson poems or a water-fall in the woods; (3) active and happy; (4) clear, bright, and sparkling; (5) happy and free.

Nocturne, *Bohn.* (1) indefinite, indescribable mood; (2) lonesome; (3) summer night; (4) soothing; (5) dreamy; (6) loving and pensive; (7) dreamy; (8) suggestion of happiness.

Minuet, *Bachmann.* (1) stately and courtly; (2) dignified; (3) active, much vivacity; (4) optimistic but dignified withal; (5) solemn; (6) peaceful, restful; (7) longing and sad sweetness.

It is evident that some of these replies express nothing more than the general action and movement of the composition. But since, after all, it is characteristic of moods that they are not clear, definite, and easily describable, and since, for this reason, different individuals might readily employ different terms to describe moods which are essentially the same, these replies show a remarkable agreement, although of course we would not maintain that different individuals invariably feel the same mood while listening to the same composition. The inducing of a mood depends upon a number of factors: the individuality and the temperament of the auditor; the degree of passivity of his attention; his extraneous associations; and the initial mood which he brought to the hearing of the composition. For instance, one auditor did not like a selection because it did not conform with his mood. On the other hand, the nature of the composition must be considered; little mood is aroused by the Allegro of a Haydn Sonata since it is 'classic,'

formal; it is pure tonal art as opposed to the 'romantic' in music which makes a more direct appeal to the emotions. The timbre of the instrument also plays a part,—the flute does not suggest the mood of exaltation as do the trombone, the pipe organ, etc. With these exceptions in mind, we may safely say that music of a certain sort may easily arouse such a mood as may be expressed in terms of confidence, yearning, imploring tenderness, mysteriousness, lightness or daintiness, elation, joy, triumph, etc.; but in every instance the listener must give himself up to the music and allow it to become the expression of his own feeling. Gurney has often been quoted as saying, 'The yearning in music is but the yearning of one note for another.' It is only when the auditor yearns with the sound, and it in turn becomes the expression of his own inner striving, that the mood is felt. The psychologist would describe this phenomenon in terms of expectation and of empathy.

F. Individual Differences

Certain typical differences in the attitudes and procedures and mental contents of the several auditors have already been indicated. Any attempt to describe or to classify these individual variations encounters a two-fold difficulty, because the types which are here represented are neither wholly discrete nor sharply demarcated, but merge into one another through intermediate gradations; and because the typical differences themselves must be described from various points of view if we are to obtain a complete envisagement of their characteristics. We shall, therefore, endeavor to describe the more prominent traits of imagery, associations, emotions and moods, attention, bodily reactions, and finally, certain miscellaneous characteristics of attitude and procedure.

Observer R. This auditor was characterized by an exceedingly great profusion and a great vividness of visual imagery. These visual images were never static, but always referred to objects which were in active movement throughout,—dancing, marching, and the like. Familiar associations were rarely present, *i.e.*, only in very exceptional cases did this auditor report that musical selections aroused memories of past experiences. Emotion and mood were invariably present in more or less intensive form, although these two mental contents seldom expressed themselves in detectable motor reactions. It is particularly characteristic of this auditor that her experience usually assumed the form of a mood rather than of an emotion. Although muscular reactions were lacking, her visual-motor imagery was exceedingly vivid and definite; she herself was either an active participant in the dances, marches, etc., or an exceedingly interested and keenly observant spectator of these scenes. It should be noted that these imaginal contents were by no means mere memories of the past; unfamiliar scenes, and unfamiliar steps and figures

in dancing were frequently present, and present in such intensive degree that she was able, after the sitting, to demonstrate the novel steps and figures of the dance. It is also characteristic of this auditor that her imagery always assumed coherence and system,—it was always a story, a drama, a dance, a procession, or the like; and it is also characteristic that she herself did not consciously contribute to the inventing of these coherent constructions of imagery; she was merely a participant or an on-looker. Indeed, although intensely interested, she manifested only passive and one-level attention throughout. The following excerpts are typical introspections of this observer; additional illustrations will be found on page 254.

Benedict, Carnival of Venice; Xylophone. 'When the music came, I did not know where I was; soon noticed that I was in a theatre; I thought that a drama was coming; a lady wearing a green dress came in and began to dance. Her skirts flew just like a butterfly; sometimes she jumped and one really thought she was flying. Suddenly a whole group of girls came in and they tried to dance with her. Finally the girls went back and disappeared. Then boys came in, danced like the rest and disappeared. During the last part of the music the woman first danced alone, then the girls came in and danced with her. Their movements were exceedingly rapid,—zigzag and flitting. The figures they formed on the stage were much like a figure eight.'

Hauser, Cradle Song; Cello. 'After one or two phrases I saw a landscape—moonlight, castle with garden, lighted window; could see young people; a piano was playing. Outside a man was singing a love song to the girl who was playing the piano. His face was sad; he would so like to have her hear him. She began to play again; he sang his song again. Suddenly he stopped and turned; his face was very sad. Then another man came from the garden and looked at the man who sang. Then the song was sung again. The singer went to the door and put on his hat; he was dressed like the trumpeter of Säckingen. I could see the white ruchings on his sleeve. At the last, he was standing at the door, looking hopelessly at the floor. He did not know whether to go or not. I was standing perfectly still; I felt with him.' After an interval of sixteen days, the same composition (Cradle Song) was played again. On this occasion, her report was as follows: 'I saw a sunny landscape, houses, gardens and flowers. It was autumn. In one house, a girl was playing a piano and a man was singing. The song tried to express his desire for her to go away with him. His face was unhappy because she refused; he begged her to go; told her how he would feel if she did not go. She was happy, apparently, an ironical smile,—she was probably trying to deceive him. Suddenly he touched her on the shoulder; she looked up, saw his face, and became excited, but in her heart she did not care. His face took on a more hopeless expression; he sang with more and more feeling. Once or twice he felt hope; he thought of the happy future they might have together. At the last, he gave up entirely and put down the music with great sadness. He continually gestured with his head, eyes, and hands; she continually played the piano.'

Observer Fn. In this auditor, visual imagery was almost wholly lacking; and when it did occur, it apparently played an exceedingly insignificant rôle. He almost invariably reported a profusion of auditory images; motor images were usually present, though in lesser degree. The auditory imagery was concerned with the *Abklingen* of notes that had just been heard, or with the anticipation and prediction of notes which were, in his opinion, likely to follow. His motor imagery had to do chiefly with imagined reactions to the rhythm, and in lesser degree, to the phrasing; imagined or executed movements, which are concerned in the act of playing the violin, were also present in some degree throughout. It was characteristic of this observer that he frequently tended to localize pitches and changes of pitch in a graphic schema in external space,—a procedure which was accomplished in purely motor fashion. It sometimes happened that definite associations from the past were present when the musical composition was familiar, but these played an insignificant part in his enjoyment of music; for instance, familiar compositions were enjoyed, not because of their wealth of pleasing associations from the past, but because their familiarity facilitated the auditor's analysis and his prediction of the development of the theme. His attention was active throughout, save in those rare instances where his typical attempts to analyze the composition failed utterly, and where, for that reason, he lost interest in the composition. His emotive experience was usually characterized by the presence of emotions rather than of moods; and his emotions almost invariably assumed a two-dimensional form, pleasantness-unpleasantness, excitement-repose. Moods, however, were not wholly lacking, especially when the less active sort of attention was present. His bodily reactions had to do, in almost every instance, with his own imagined act of playing the composition upon his violin.

The essential characteristic of Fn.'s attitude and procedure is describable as intellectual or analytic. He invariably analyzed the work of the composer, and endeavored throughout to understand and even to predict the development of the composition. And his enjoyment of music is determined essentially by the success with which he meets in his analysis and prediction.

Rubenstein, Melody in F; violin and piano. 'My first thought was: 'I heard it last evening;' the whole situation came back, chiefly in visual terms. Then I returned to the present rendition. I began to think the music; simply took it in, and played with my imagery, which

was almost exclusively auditory. Then I thought: 'Pshaw, I am not listening, but after all, this is the way I listen to music.' About the third section, where the bass goes up and down, I vocalized it; I made no sound but felt it in my lips. This composition is interesting to the very end, due, I think, to the rhythm; there is always something new throughout. The *diminuendo* and the *retard* at the end interest me most. When the music was over, I said almost aloud: "O, that's fine, that's fine." Then my attention drifted away for fifteen or thirty seconds. By playing with the imagery, I mean that I recall the notes which have just been heard and compare them with the present notes as to pitch, duration, and intensity. I also anticipate what is likely to follow. I do not follow the notes with my throat, but I simply hear them as if they were still ringing in my ears. This image is very much like hearing the same notes over again. I can readily reproduce the last phrase or two; and I like this reproduced sound even better than the sound which is objectively present.'

The following excerpts illustrate this auditor's kinaesthetic reaction: 'I felt this selection as if I were playing it myself; I could feel the action of the bow and of the moving fingers.' 'Near the beginning, I had a distinct motor image of my arm playing the music.' 'I had an experience as though I were sitting in the orchestra and were myself playing the selection; I localized the up-and-down of the music; this is motor, not visual. I had a motor image which assumed the form of a graphic outline movement, somewhat like the attention curve.'

Braga, Angel Serenade; Violin and Cello. 'A feeling of familiarity when the music began though I could not recall the name. However, I knew it sufficiently well to be able to anticipate what was coming. At first I followed the music very closely, listened, spanned, anticipated, with auditory imagery. When the cello entered I began to vocalize, made no noise but felt the strain in my throat. I thought that the cello part was fine, it made such a splendid contrast. I noticed suspense or expectation at the end of phrases. Then attention wandered, drifted away; I did not vocalize any more; I cannot recall what my thoughts were at this point. Then I returned to the analysis of the music; became aware of myself as analyzing. I anticipated the end of the composition, thought it was fine; it let me down so easily. Attention was fluctuating throughout. The selection was familiar so that at times I drifted in a vague, dreamy way. The mood was quietness, restfulness. There was some excitement near the end; but pleasurable throughout.'

Observer Fs. This auditor reported visual and motor imagery much more frequently than auditory images. Her visual images occasionally but rarely assumed the form of a coherent story, and these stories were exceedingly brief and intermittent. Her motor imagery usually had to do with her own act of playing the violin or piano; occasionally, it had to do with dances in which she participated. The visual imagery almost invariably found a setting in a ball-room scene, or the like; but she also visualized the performers who produced the music. The associations aroused by the music were numerous; they usually concerned the situations in which the composition had formerly been heard; her atten-

tion was intermittently active and passive. When active attention was present, it was concentrated upon the *timbres* of particular instruments, unusual rhythms, novel chord progressions, and especially upon the quality,— excellent or mediocre,— of the rendition. Her emotive experiences were most frequently characterized by pleasantness-unpleasantness; excitement-repose were reported in numerous instances, but sometimes they were not present. The emotive experience usually took the form of a mood when her attention was passive; and it may be added that visual imagery and extraneous associations were seldom present, excepting in passive attention. Her bodily reactions were frequently and intensively experienced; these usually had to do with the act of playing the violin or the piano, but occasionally she reported kinaesthetic imagery and kinaesthetic sensations which were concerned in the experiences of expectation, and of excitement and relaxation.

Hauser, Cradle Song; Cello. 'During the fore-period I was curious as to what the music would be. I recognized the composition within a few seconds; a slight uneasiness before the name occurred to me; then a slight lapse of attention. I seemed to be playing the cello myself, and I was conscious of the difficulty of bringing out the tone upon the cello,—it is so different from the violin; this was motor imagery; had a vague feeling of discomfort in trying to play it; then a dim, visual image of a friend who plays the cello, an intermittent image of him as he appeared at an entertainment last winter; the skillfully performed *portamento* gave me a sustained pleasantness; close attention throughout, but stronger where the pleasure was greater. I usually held my breath a little at the end of movements; the attention varied; more attention when more pleasing; in several places I had a motor image of playing the accompaniment on the piano, a specially clear image of striking the octaves in the bass with my left hand; no imagery of my right hand (in the plethysmograph); clearly conscious of the rhythm at times, and of a tendency to sing at times; toward the close I was very attentive, to the harmonics especially; I knew that it was coming to an end but did not anticipate what was coming next; after the close, a distinct awareness of relaxation; and I lingered on the feeling of pleasure.'

Sousa, Diplomat March; Military Band. 'Concentration of attention came slowly; I realized that it was a march; clearly aware of the rhythm; innervation in the foot and left hand, none in the right hand; visual image of soldiers marching and keeping time, but I did not see any faces; for a time I tried to single out the various instruments; at the change in movement, I had a visual image of the grand march, pale pink and cream dresses, and the black of the men's suits. This scene was not very clear; the line was actually moving; I was not aware of any movements of my own; when the music changed, the figure of the march changed; my attention shifted, and an instant later, I was listening to the flute, the visual picture having receded; later, everybody began to dance; I got a visual-tactual-motor image of the smooth floor under my feet.'

Observer W. This auditor reported not a single instance of auditory imagery; her visual imagery, while vivid, was usually fluctuating and intermittent. Her motor imagery was exceedingly clear and profuse throughout; it usually had to do with singing or with the oscillation of the whole body, floating in space, to the rhythm of the music. Her associations were frequent; they were memories of persons or scenes which had formerly been associated with the familiar musical selection. Her attention was for the most part passive, but occasionally it assumed an active form, especially when she was interested in picking out particular instruments from the orchestra, and when she admired the skill of the performers. The play of visual and motor imagery, with their extraneous associations, usually ran their course in passive attention. Moods were frequently reported, and emotions were invariably present. In these emotive experiences, both pleasantness-unpleasantness and excitement-repose were of frequent occurrence. Her bodily reactions, either imaginal or real, were the most prominent components of her experiences. Various parts of her body, hands, feet, trunk, head were concerned in these reactions; she marked the rhythm, and usually was aware of muscular sensations and imagery in the presence of scale passages, and of abrupt changes in pitch and in rates of succession. Her respiration almost invariably changed in both depth and rapidity with the change in the movement of the music.

Victor Herbert, Badinage; Orchestra. 'This composition was very interesting, both in melody and in rhythm; had no visual imagery until near the middle; felt muscles of face move; music such as this, containing quick steps, followed by slow steps, gives me great pleasure; at the change in movement, I saw boats on the water in the moonlight, the oars keeping time to the music; I heard music and wondered where it came from; I thought it must be from an orchestra on the boat; there was a charming scurry near the end of the selection; my pleasure was chiefly motor; I picked out tones of some of the instruments, noticed the harp especially; did not see the players; I felt the run up the piano scale, but did not see the piano.'

Rubenstein, Melody in F; violin and piano. 'The first thing of which I was aware was a consciousness of pleasure; I felt as though my whole body were swaying without any active movement on my part; I was out in space, not touching the earth. If my body could have been connected with an automatograph, it would have swung to the right for two movements, then to the left for two movements; this lasted throughout; visual image of a friend who plays the violin; she sways a little while she plays; I saw and heard her breathe; at the interlude, I saw her take down her bow and screw it more tightly; I felt my head moving at one passage; felt release from tension when the music stopped.'

'The experience was motor throughout, a distinct tendency to move my head, hands, feet, and fingers, but I believe I inhibited the movements of my hand,' (The plethysmographic record shows that she did not.) 'I felt as though I were being swung in a hammock. Sometimes I have a tonal image which sways, as if the tone were swinging back and forth like a pendulum. The music arouses motor tendencies immediately, first in one shoulder and then in the other, then in legs and feet; finally, a dim, visual image of the dance. I frequently feel as though I should like to dance while the music is being played, and, indeed, I sometimes feel as if I were dancing.'

Observer H. This auditor rarely reported a visual image. At infrequent intervals, he seemed to see the conductor, the orchestral instruments, etc., but these images were vague and fleeting. He very often reported auditory imagery,—parts of themes and motives, and even individual tones, in their appropriate clang-tint. The distinguishing characteristic of H. was his invariable tendency to movements of all sorts,—humming, singing, whistling, beating time, dancing, marching, and the like. Motor imagery was rarely found, and then only of a vocal motor sort; this negative report is probably due, in part at least, to the fact that the actual movements were themselves present. It seldom happened that the music recalled memories from past experience; yet his reactions to familiar and to unfamiliar compositions were characteristically different. In the former case, he attends closely to the music throughout, and he is aware throughout of definite and intensive muscular movements; in the latter case, his attention is not held by the composition, but wanders away to such incidental matters as introspective data which he will subsequently report, to the mechanical perfection of the phonograph and the like. Pleasantness-unpleasantness and excitement-repose are experienced in marked degree. As already indicated, this auditor is characterized by an exceedingly intensive motor reaction to music. He reports that these actually executed movements of all parts of his body are absolutely essential to his enjoyment of music. Music which is heard in a brightly illuminated auditorium or in a dignified assemblage loses its charm because he feels obliged to restrain his motor expression.

Sousa, Diplomat March; Military Band. 'The music came with a bang. I fell in with it and marched down the street; my head, arms, legs, fingers, my whole body, moved with it. Soon I began to whistle the tune; this took more attention, and my legs, arms, etc., stopped as if satisfied. I did not whistle throughout; near the end of the composition, my hand began to move again. I forgot all about my headache, did not care what the music was; did not notice the instruments except that they were all wind instruments, and mostly brass-wind.'

Wagner, Prize Song; Cello. 'The music came gently; it did not dis-

turb me nor raise much enthusiasm. There was little impulse to move the hands or feet or to sing. I realized that it was a cello solo with piano accompaniment; unfamiliar; once or twice felt that I ought to know what it was; realized the richness of the tones; felt that it was an excellent composition. There was a slight twitching of muscle in the upper fore-arm after the first interlude. At the close, my mind was away from the music; near the last I wondered what sort of a selection it was; tried vaguely to recall how many motives there were.'

After concluding an introspection on one occasion, he said: 'There are two kinds of motor reaction,—keeping time and singing. The latter brings in the clang-tint; where these two are combined, I find my greatest pleasure. I enjoy rich, full chords without the time element; this is more static,—the joy of reverie. The former is activity; it is like a long march, where one stops occasionally to enjoy the scenery.' Again, he said, 'I feel as if my whole body moves with the swells of the music, like the movement of the violin bow.'

Observer V. The auditory imagery of this auditor was inconspicuous, although occasionally reported. Her visual images were exceedingly clear, detailed, and frequent; their colors were vivid and striking. She saw scenes upon a stage, processions in the street, etc., where the colors of the costumes and of the musical instruments were richly variegated and of deep saturation. Her motor imagery, however, constituted the major portion of her sensory mental content; these images were usually referred to the movements of her own members, the swaying of her body, etc. Childhood memories were frequently aroused; familiar compositions tended to reinstate former situations. Active attention was almost invariably absent; reverie, day-dreaming, and passive attention in general was characteristic of her attitude toward music. Moods were of frequent occurrence; pleasantness-unpleasantness was almost always present; excitement-repose was also reported throughout.

Pierne, Serenade; Instrumental Quartette. 'Shortly after the music came, I felt as though my body were swaying, but it was not. I was conscious of breathing deeply, and felt a strain at my hips; the swaying was from left to right; I alternately felt the strain on one hip and then on the other; this was not due to breathing but was coincident with it; had a visual image of a field of wheat swaying in the wind; when I attended to the piano and violin, I got the impression of a question and answer in the music; when the violin became fainter, the visual image faded away; also was conscious of rhythm which coincided with the motor image and the visual image; had a distinct anticipation of the close of the selection, and held myself poised for the *finale.* At intervals I noticed a tendency to move my eyes; a peaceful, pastoral, restful feeling; was lulled by the rhythm.'

Bizet, Pearl Fishers; Concert Band. 'The first thing of which I was conscious was a procession of gaudily dressed soldiers; they were not Americans; the wind was blowing the plumes in their hats; a military band was playing; the soldiers were marching; no movements in

my own legs, but contractions at hips. I saw a man standing in an open carriage bowing to the people, pale face and very red hair; blasé women with him in the carriage; lions walked in the street after the carriage. It occurred to me that this was strange, but I noticed strains in the music which sounded like the roar of lions; my visual picture persisted. Then came priests or choir boys swinging censers in rhythm; I was profoundly impressed by the motor accompaniment again. Then, I seemed to be in a church; the priests marched in slowly, and circled around; the soldiers were dressed in blue; I saw the gleam of yellow light on the censers. After the music had stopped, I was confused by the incongruity of it all. This is my ordinary way of reacting to music. When I am fatigued, it always rests me to hear good music because it carries me so far afield, I see so many unusual spectacles; the music suggested a story, an Arthurian legend. I was very much impressed by the dignity and beauty of the court; it was a peculiar feeling with a tinge of sadness in it. I was in the country; dark clouds were scudding across the moon; a melancholy weird place. The piano at first suggested the rustle of leaves, but this did not suit; then, it suggested an expanse of water; I saw the waves and the light gleaming on them. Just such a mood as would come on such a night was present here; it was pensive, rather than melancholy. The change in time was followed by muscular strains in my arm and hand; I followed the rapid little places on my toes; in the slower parts I had a tendency to hold my muscles in suspense, waiting for the rapid places; the music was not pleasant, because it was fatiguing to remain so long on my toes.'

Observer C. This auditor was characterized by a total dearth of auditory imagery; nor was visual imagery ever reported, save in exceedingly rare instances. His dominant imagery was of a motor sort, usually vocal-motor, although there were frequent manual-motor images which had to do with the localization of the pitch relations in a graphic schema in external space. Memories of former situations and former experiences were frequently aroused by familiar selections. His attention was active throughout. This auditor was interested in the compositions as a psychologist, and not as a musician; his was a distinctly introspective attitude, but he insisted that this was his typical attitude in listening to music. Unfamiliar compositions and compositions in which the melody was not prominent usually failed to interest him, and he gave more non-emotional introspections than any other of our auditors; but moods of various sorts and the emotion of pleasantness were usually reported when the selection was familiar. His most prominent reaction was of a motor sort; various parts of his body reacted to rhythm and to melody; and the experiences of expectation and satisfaction were accompanied by muscular tension and relaxation. He is convinced that these muscular reactions play a prominent part in his enjoyment of music.

Hauser, Cradle Song; Cello. 'When the music came, there was a relaxation. I tried to recognize it but could not; I noticed the violin,—vocal-motor image of violin. I anticipated to see whether the note would go up or down,—a tendency to accompany the change in pitch with my body, to ride with it; often, the note does not go where I want it to go. I noticed the piano accompaniment late. There was a constant motor accompaniment,—head and eye-brows, and changes in breathing; I forgot my right arm entirely. I enjoyed the music; it was restful; almost but not quite melancholy.'

Herbert, Badinage; Orchestra. 'Music came rather suddenly; feeling 'I like that.' There was a relaxation; a feeling of disappointment when I discovered the jerkiness of it. Music faded a little and a partly visual image of the orchestra came; I saw more of the leader than usual. The quick little passage was vaguely projected a little above me with a movement something like writing in the air; this was visual-motor. At one place, I thought the music would cease; I was all attention, but it did not stop; there was a pause, a little uncertainty, then music went on again. I felt a settling back as before,—a change in the muscular feel, but this was vague. Feeling 'Why does he break it up so'—awareness of thought: 'It is going to settle down.' A visual image of one end of the orchestra at a theatre; vague verbal image of 'Poli's Theatre.' When at last, the conventional form of the *finale* approached I recognized it clearly.'

Observer S. This observer occasionally reported visual imagery; he seemed to see the conductor of the orchestra or the orchestra itself. Auditory imagery was wholly lacking. His motor imagery was frequent and vivid; and in addition, he tended to beat time and to sway to the music. Memories of former experiences were sometimes aroused by the compositions; but his most frequent memories had to do with similar compositions which were suggested by the present selection. His attention was almost invariably passive; and there never was any attempt to analyze musical compositions. He reported emotions of pleasantness, excitement and repose, but none of these were ever present in intensive degree. In the case of excitement, he was always aware of muscular tenseness. His moods included only those which might be described in such terms as 'quiet' or 'excited.' The chief component of his mental content was almost entirely motor. He was conscious of rhythmic muscular movements throughout. The pitch relationships were projected into external space in a motor-visual schema; his memory of musical compositions always assumes this form.[7]

Sousa, Diplomat March; Concert Band. 'When the music began, I had almost immediately a visual image of a band standing in circular formation. Each musician was swaying to the music, and I seemed to

[7] It may be added in this connection, that S. possesses an exceedingly definite motor-visual number-form which, he reports, is of distinct service to him in his dealing with numerical relations.

be swaying myself; I had a visual image of the band-master beating time with a baton; I was conscious of the rhythm, and I seemed to be swaying with it; I had no tendency to keep time with hands or feet, but only with my body as a whole; at no time was I aware of the presence of the apparatus or of the phonograph; I was conscious only of the band and of the music; I saw the players take down their instruments at certain stages during the selection, and put them up again before they began to play.'

Toboni, Hungarian Fantasie; Orchestra. 'No imagery except muscular; I seemed to sway up and down in the air; in several places I felt as if I were conducting the orchestra; I felt myself going through the motions; when one instrument came in *solo* and the others came in later, I felt as if I were being dragged, as if I were heavy; I seemed to be responsible for holding the instruments together; I must do my part or the orchestra will break down; I knew when the *finale* was coming; this came in motor terms. When the music suddenly stopped, I seemed to come down with a thud; when it rose to a climax, I rose with it, became more tense, then I dropped.'

A survey of the introspective descriptions of our eight auditors reveals the fact that while they all possess certain characteristics in common, yet they manifest wide individual differences. It is therefore difficult, if not impossible, to classify musical attitudes and musical enjoyment into types, if by types we mean absolute differences in habitual mode of reaction. The individual variations which have been revealed are differences in degree only. For instance, the attitude of every auditor partakes in some degree of the characteristic which is describable as intellectual, in the sense that it is critical and evaluating. That which is evaluated, however, may, in one case, be the art of the performer, and in another case, the art of the composer. The standard of evaluation may vary between exceedingly wide limits,—between the criteria of the naïve and unsophisticated dilettante and the criteria of the educated and refined musician. This critical or evaluating or intellectual attitude is the most conspicuous attribute of the trained and cultured auditor, while it is a wholly subordinate characteristic in the naïve and untrained auditor. While it is possible to regard these two individuals, manifesting such extreme differences of attitudes as they do, as representatives of different types, one finds that the matter of classification is complicated, in practical experience, by the fact that numerous intermediate variants of attitude are interpolated between these two extremes; and the same difficulty will be encountered if we choose any other characteristic in the auditor as our basis of classification.

When we compare the several descriptions, point for point, we find that no essential differences between individuals are revealed in so far as emotive experience and motor reactions

are concerned, and that the greatest differences have to do with imaginal content, behavior of attention, and general attitude toward music. There are individuals in whom visual imagery *per se* constitutes a chief basis of musical enjoyment; and there are individuals in whom visual imagery makes no direct contribution whatever to musical enjoyment. It is true that these two types of individual are also distinguished by differences in attitude and by differences in behavior of attention; the former type of auditor is usually a relatively impassive spectator of a kaleidoscopic scene,—a dance, a drama, or a procession. Not only is this auditor characterized by a passive attention; he is also characterized by a relatively uncritical attitude toward the work both of the performer and of the composer. On the other hand, the individual in whom visual imagery plays no significant part, may derive his enjoyment from either of two sources: from his motor reactions, in which case he represents a mode of procedure which is common to all auditors, but which is here present in exaggerated form; or, from his auditory imagery, which in turn, furnishes him with the means of analyzing the work of the composer and of appreciating the subtler shadings of musical meaning which are lost to the auditor who does not habitually adopt this analytical procedure. It is to be added that characteristic differences of attention are also exemplified in these several types of auditor. The analyst must, in the very nature of the case, concentrate a high degree of attention upon the task he is undertaking if that task is to be successfully accomplished; on the other hand, the auditor who derives his keenest enjoyment from involuntary motor reaction to the music, or from a vivid play of imagery of which he is a mere spectator, may be characterized by the fact that his attention is the very opposite of active. Concomitant with this difference of attitude and with the corresponding difference of attention is a difference of source of enjoyment. In the case of the analyst, enjoyment is essentially due to an intellectual appreciation of the art of the composer (and of the performer); in the case of the non-analytic type of auditor, enjoyment is essentially of sensory origin,—traceable to pleasing timbres and nuances of tone, to pleasurable associations aroused by the composition, to enjoyable motor reactions, to rhythm, to changes in pitch, and the like.

Our introspective descriptions show no qualitative differences between observers in so far as emotive experiences

and motor reactions are concerned. They do, however, show exceedingly great differences in the degree in which these two factors may be present; and these differences are so great as to constitute a difference in type of auditor. Certain auditors assume a coldly critical attitude; their rôle is exclusively that of the observer of a production in which they take no part; these auditors are relatively inactive. Their motor reactions play an insignificant part; and their emotions are usually describable in terms of pleasantness and unpleasantness alone. In the case of the auditor of the other type, the music is an expression of himself; he feels himself into it; he himself moves with it; and his *Einfühlung* and his *Mitbewegung* are of paramount significance throughout. The extreme representative of this type cares little for the analysis of the composition as a work of art. His enjoyment is due, in great measure, to his own imagined or real activity. The dimension of excitement-repose is here added to that of pleasantness-unpleasantness; and moods are usually present in more intensive form. The musician of exceptional temperament and exceptional culture probably represents the analytical attitude in more extreme form than was observed in any of our auditors; and it seems to be equally probable that the average auditor is to be assigned to a position between the two extremes which we have described.

V. CONCLUSIONS

In the foregoing descriptions and citations from the introspections of our observers, we have endeavored to include every important item which seemed to have significance for the appreciation and enjoyment of music. The experiment proved to be a revelation not only to the observers, who continued to develop more and more introspective skill as the experiment progressed and who never ceased to wonder at the invariable presence and apparent functional significance of their kinaesthetic experiences both sensational and imaginal, but also to the writer, who, after several years' experience as a college teacher of music, was guilty of a bias toward a purely auditory enjoyment of music.

The summary and conclusions which follow are therefore, entirely the conclusions to which the facts established in the investigation have impelled us. The conclusions may be summarized under two heads.

A. Physiological

1. Listening to music is accompanied by disturbances in the distribution of the blood supply; but there are numerous indications that these circulatory changes may be referred, for the most part, to variations in the function of attention; and that they are not symptoms or products of emotional variations or of any other variations which are characteristic exclusively of music as such.

2. Under the influence of music, the heart-rate tends to increase; whether attention be voluntary or involuntary, active or passive, and whether the tempo of the music be fast or slow.

3. Under the influence of music, the chief characteristic of respiration is irregularity, both as to rate and as to amplitude. This degree of irregularity varies directly with the intensity of the emotion experienced by the observer. The rate of respiration, while irregular, tends to increase over the normal. No constant correlation between respiration and the musical phrasing can be established.

4. The muscular reactions, including not only those movements which are made in unison with the musical rhythms, but also those movements which are found to be invariable or all but invariable attendants of feelings of strain and relaxation, are of great importance in the appreciation of music.

B. Introspective

1. The enjoyment of music is a complex experience. The components of this experience are or may be:

a. A pleasurable emotion which is due to the timbres of the instruments and to their nuances of tone.

This component is subject to wide individual variation. There is a distinct affective coloring which inheres in musical sounds as such; certain individuals have an especial fondness for the violin, others for the trombone, etc. Others again do not prefer the clang-tint of any particular instrument but derive an especial enjoyment from certain combinations of timbres, as *e. g.*, the combination of flute and violin, of the various wood-wind instruments, the various stringed instruments or any other *ensemble* effect.

b. A pleasurable reaction on the part of the observer himself to the rhythms of the musical composition.

This again is subject to considerable individual variation; yet it is a fact that every auditor reacts to music with a more or less definite and pronounced motor response. This response may consist in the more patent and obvious movement of beating time; and it may run the gamut through the various gradations from this crude reaction to the subtlest play of sheer images of non-executed movements. Between these two extremes are found individuals who, while the music is

being played, accompany it by singing or whistling; and individuals who evince no outward signs of such a motor response but yet who follow the melody with vivid and intense vocal-motor or manual-motor images, —with at least an occasional participation of motor innervations of slight degree.

c. Pleasurable associations which are the product, in the main, of past experiences,—associations which have now become more or less familiar to the auditor.

This component is particularly prominent during the rendition of familiar compositions. In such cases, even though the identity between the remembered and the recognized melody be only partial and approximate, the present composition tends to revive the original experience during which it was heard before, together with a wealth and variety of imaginal and emotional accompaniments.

d. Pleasure derived from the observer's play of imagery,—the latter being itself a product of the musical stimuli.

Here are included the hosts of mental images from every modality of sense, which in many instances weave themselves into a story or drama whose unfolding is a source of intense enjoyment to the combined auditor and spectator; in other instances, particularly where the auditory imagery predominates in the complex, the subject tends to predict what the composer will give him next. A successful prediction is invariably attended by a glow and suffusion of emotional warmth, due chiefly to the fact that the observer feels that he is master of the situation. Those auditors who are also trained vocalists or skilled performers upon any instrument derive intense pleasure from the act of projecting themselves into the chorus or into the orchestra, and imagining themselves as participants in the production.

e. A pleasurable mood which is usually characterized by its persistence, although it may change with changes in the character of the composition.

This mood may be due, in part, to the peculiar temperament of the individual, or, in part, to the temporary emotion which may dominate him at the instant when the musical rendition begins. Yet it is true that the composition itself may arouse a mood of its own making, and for that reason may itself be described as triumphant, yearning, confident, imploring, mournful, elating, depressive, filled with hope, with abandon, with mystery, with tenderness.

f. In addition to these more specifically emotional components, there is present also an intellectual activity which can best be described as an analysis of melodic and harmonic structure, and an appreciation of the skill or dexterity of the performance itself. Both of these more purely intellectual functions contribute to an enjoyment of the composition and of the execution of the musical selection.

2. These various components are far from being of equal value and of equal significance in the appreciation and enjoy-

ment of music. While it is not possible, in the present status of our knowledge of the topic, to seriate these several components in a systematically arranged hierarchy, still it may be said that, at least so far as our observers are concerned, visual imagery makes the least important contribution; and the contributions which flow from the observers' motor reactions constitute the most essential factor for all auditors except those whose attitude is of the purely intellectual sort.

3. Just as in the average normal auditor, emotional enjoyment is a product chiefly of motor imagery and motor reaction, so his intellectual appreciation is a function almost exclusively of auditory imagery and of intellectual processes based thereon.

4. Music is powerless to portray a definite picture in any uniform or universal sense, or to convey the same group of imagery into the minds of each of its auditors.

5. An introspective analysis of the experience of listening to music indicates the existence of a variety of types of auditor. Ideally, these types may be conceived as being, at bottom, qualitatively different; but, in practice, they may exist in such intimate combination with one another that one finds it difficult, in many instances, to discover well-marked lines of demarcation between them. The more prominent typical differences which were found to exist in our eight observers are as follows:

a. The Analytic Type: To this type belong those whose ordinary procedure consists in subjecting the musical composition and also the performance of the music to a critical analysis. A high degree of attention is normally employed; and auditory and motor imagery are prominent in greater or less degree.

b. The Motor Type: To this type belong those observers, in whom the motor reaction to music is dominant. This motor reaction may take one of two forms—singing or whistling; and movements, actual or imaginal, of other voluntary muscles. In these individuals attention may be less active; and auditory imagery may be entirely absent.

c. The Imaginative Type: To this type belong all those observers for whom music constitutes a stimulus to the imagination. Their imagery may be from any or from all sense-departments. Attention may be of various degrees; but it ordinarily tends to passivity. With the lowest degree of attention, day dreams, reveries, etc., or even, in some cases, thought processes concerning matters entirely foreign to the

music, may occupy the focus of consciousness, while the music remains in the fringe.

These types, however, are not fixed and permanent. At any time, an observer may shift from one type to another by a change in the degree of attention. For example, Fn. customarily belongs to the analytic type; if, however, he finds a composition uninteresting his reaction ceases to be analytic and becomes imaginative. This shift and variation of typical procedure is common to most observers.

d. Emotional Types. It is also possible to differentiate various types of auditor from the point of view of emotive content. For instance, the extreme representative of the intellectual or analytical type of procedure is coldly critical. Not only does it seem probable that the emotional experiences and the emotional reactions of this type of auditor never reach an exceedingly high degree of intensity, but it is also probable that his emotions are always describable in terms of pleasantness-unpleasantness. Moreover, the pleasantness-unpleasantness itself is always found to be chiefly of an intellectual sort. The opposite extreme would be represented by an individual who is wholly unaware of the meaning and of the excellence of the musical composition as a work of art. The 'musical consciousness' of such an hypothetical individual would consist exclusively of motor reactions, imaginal or real, together with a play of imagery; and it would be essentially characteristic of this individual that his attention would be absolutely passive and involuntary throughout. His emotive consciousness would consist of both moods and emotions,—the former of which are characteristically lacking in the extreme representative of the intellectual type. Moreover, the emotions of the reflex or sensory or purely naïve are distinguished by the fact that they are of a sensory sort exclusively, and by the additional fact, that they run the gamut of excitement-repose as well as of pleasantness-unpleasantness. These two extremes of type are seldom if ever encountered in practical experience. The closest approximation to the intellectual extreme is undoubtedly to be found in those composers and professional musicians who exalt the intellectual and decry the emotional in music. The opposite extreme of procedure is to be found in the purely reflex reactions of those volatile individuals who are popularly described as belonging to the emotional type. Between these two extremes of emotional procedure is to be found a place to which may be assigned any given normal auditor; and when this seriation is com-

pleted, it will be found that individuals belonging to different points upon the scale differ from one another in the following characteristics: dominance of mood; composition and content of emotion (*i.e.*, presence or absence of *Einfühlung*, presence or absence of sensory or intellectual emotions); relative profusion and significance of imagery; relative intensity of motor reaction, real or imaginal.

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PSYCHOANALYSIS: A REVIEW OF CURRENT LITERATURE

By Dr. J. S. Van Teslaar

1. S. Freud. Die Handlung der Traumdeutung in der Psychoanalyse. *Zentralblatt f. Psychoanalyse,* II., 1911, 109-113.

In this paper Freud discusses some points in the technique of dream analysis bearing on the question: what practical uses may be made of the art of dream analysis in the psychoanalytical treatment of neuroses?

It is ordinarily understood that, for clinical purposes, the analysis of dreams must be thorough. This requires a great deal of time. Before one dream has been examined completely the patient returns with other dreams which appear of even greater diagnostic import. Soon the consulting physician is overwhelmed by the amount of material on hand requiring analysis, so that he can hardly do justice to it during the hour set aside for consultation. Occasionally dreams are prolific; and the patient's understanding of the incidents recorded therein is faltering and slow. The physician's effort at penetrating the source of trouble is thwarted on all sides by the patient's subconscious unwillingness to coöperate. Meanwhile dream material keeps accumulating. Under such circumstances one feels inclined to renounce all attempts at thoroughness of analysis or else is compelled to devote attention only to a portion of the material.

Freud suggests that in all such cases it is preferable to limit one's attention to what material may be dealt with properly during the hour set aside for consultation rather than abandon thoroughness. Where a new promising dream is reported it is always well to take it up even if the analysis of an older dream is interrupted and must be postponed indefinitely. In other words, where material accumulates so fast that a choice becomes necessary it is of advantage to decide in favor of the latest dream and to set aside, if necessary, observations already made in connection with an older dream.

On the other hand, one should avoid giving to the patient the impression that a new dream is expected or is in any way essential for the proper continuation of the task of analysis. Such a notion might easily focus the patient's subconscious opposition upon the field of dream memories and the fountain source of material would suddenly run dry; there would be no dreams to report. On the contrary, the patient should be made to feel that it is immaterial for the progress of the work whether any new dreams are reported or not.

It is well to bear in mind that in severe neuroses most dreams are built upon the whole pathogenic material, the details of which are unknown to subject and physician alike, so that a complete analysis of such a dream is out of the question. It is only as physician and patient get closer together and win each other's confidence that the required light from the intimate life history of the latter is thrown upon the incidents revealed in the dream. Where the whole content of a complicated neurosis of long standing is translated into the symbolical

language of a certain dream, an exhaustive interpretation of the dream is not possible at one or two sittings or in the interval between it and another, perhaps equally interesting dream. To arrive at a complete understanding of such a dream would be to unravel the whole of the series of pathogenic complexes which the experience of a lifetime has gradually precipitated into the subconscious; and this is not possible without a knowledge of the actual incidents of intimate order out of which the complexes have thus been formed. As a rule, the examiner must remove a great deal of subconscious opposition from his path before this can be accomplished. The meaning of a dream is often uncovered rather gradually, perhaps only in the course of months, by keeping in mind its main features while the patient's analysis proceeds along other lines.

When a partly analyzed dream is abandoned for a later report, little is lost because, as a rule, new dreams only represent the same material in a different and perhaps more penetrable form. A new dream may throw a new and highly welcome side-light on the same material that was studied in a preceding dream. Indeed, sometimes the best way to unravel the meaning of a particularly baffling dream is to abandon it purposely, for a time, follow the clues of newer dreams, and compare the findings from time to time.

Freud insists that for therapeutic or diagnostic purposes it is never necessary to instruct patients to write down their dreams during the night or even at the earliest opportunity in the morning. A dream which may be rescued from oblivion by this means is not likely to prove of any particular value in the task of clearing up the patient's condition. No special means for taking care of dreams are required. The dreams the patient remembers and relates spontaneously furnish the material needed for all practical purposes.

2. Rudolf Reitler. Eine infantile Sexualtheorie und ihre Beziehung zur Selbstmordsymbolik. *Zentralblatt f. Psychoanalyse,* II., 1911, 114-121.

Reitler discusses the relations of suicidal impulse in the adolescent to the infantile sex theory of Freud in connection with the report of a clinical case which came under his observation,—a woman, 42 years of age, presenting as the most persistent and troublesome symptoms for which she sought psychoanalytic treatment, neurotic enuresis, excessive onanism, and extreme sleeplessness.

The first trouble was so severe that on account of it she was unable to travel, attend any society functions or even absent herself from home for any length of time. Her onanistic excesses were not accompanied by the usual sex phantasies or indeed by any sexual imageries. During actual sexual intercourse she remained frigid. To induce orgasm in herself on such occasions she had to contemplate in her phantasy a scene in which a man in the process of urinating played the chief rôle. Strong relations being thus established between this phantasy, or rather, the act it portrayed, and sexual satisfaction it was perhaps logical that the woman should resort to masturbation as a means of overcoming her urinary trouble.

Her sleeplessness was extreme and the author's analysis was directed especially to its solution because it was the most troublesome of the patient's symptoms. The patient believed herself extremely sensitive to noise. Accordingly, she had instituted all kinds of measures for the exclusion of sounds from the neighborhood of her sleeping room. The residence was chosen on a side street seldom visited by wagons, on an

upper floor. The rooms on each side of her sleeping chamber remained empty and securely locked up. The windows and doors to her room remained closed summer and winter, and all crevices and cracks were stopped up. Heavy portieres and curtains, cushions and carpets were distributed everywhere. But all these extreme precautions to deaden sound proved useless as she continued to pass sleepless nights. This condition of extreme sleeplessness had lasted for many years preceding treatment.

Under psychoanalytical inquiry it was soon found that not the actual perception but the fear of noise was what kept her sleepless through the nights. Under the extreme precautions she had taken she could have not been disturbed by the actual occurrence of sound. What really kept her awake was the thought that noises may occur and prevent her from going to sleep. Simple as this fact is, the patient, at first could not be induced to see the difference between actual noise and the unpleasant anticipation of it. Her manifest unwillingness to recognize this difference pointed thus clearly to a subconscious opposition against the discovery of the guilty psychic complex which lay undoubtedly hidden in this direction. This was only to be expected and served only as a sign that the inquiry was approaching the source of trouble. Patients always show opposition at such critical times. Their memory fails them or their understanding seems to be serving them poorly. The woman had been under psychoanalytical treatment long enough to understand the guiding principles of this method and was well aware at the time that if she acknowledged that not the noise but the fear of it kept her awake the next step would be to trace this fear back to some unfulfilled wish of a very intimate order. Naturally enough patients strive against being confronted with those innermost features of their psychic mechanism which are incompatible with the ethical and social standards forming the framework of ordinary conscious activity.

At this point the author suspected that there may have been a time, perhaps during her childhood, when the patient chose to lay awake nights in order to listen to some mysterious or pleasurable sounds of some kind. Later on, under the restraint of a consciousness dominated by the usual ethico-social ideals of conduct with which children become imbued she may have wanted to turn away from this shameful thing but the suppression of the effect was only partly successful even if the actual occurrence was completely rooted out from conscious memory. The accompanying affect, incompletely repressed, manifests itself now under a morbid form as fear. At first the patient denied every intimation along this line. Asked pointedly whether she had ever witnessed the sexual act among her parents as a child she did not fly at once into a defensive attitude, as subjects often do, forgetful of the maxim, qui s'excuse, s'accuse. Instead she couched her denials in temperate, well ordered language without undue protestation and without recourse to illogical argument to prove the impossibility of such an occurrence. In short, she did not protest too much. The manner of her denial was such that there was no reason to suspect the usual opposition which neurotics fling subconsciously across the examiner's road whenever his inquiries approach sensitive ground. It was clear that the patient had really not witnessed the sexual act among her parents as usually understood. What she did see, while a child, she could not tell, at least she remembered nothing of it at the time, but this came to the surface quite incidentally later.

Author and patient were conversing about suicide one day. She con-

fessed having at one time contemplated this act; she intended to use for the purpose her father's army revolver because, she stated, it symbolized more closely than any other means of self-destruction she might have chosen her return into her father's arms; also the man on whose account she was entertaining thoughts of suicide was an army officer, like her father, and this may have had something to do with her choice. That the patient was aware of the symbolic meaning of the pistol, in Freudian terms, at the time of this conversation, became evident by a remark she had made in the course of her story. But her suicidal phantasies centered much more persistently around illuminating gas. She liked to picture herself committing suicide by throwing the gas jet wide open. Much to the author's surprise, in relating this phantasy, the patient laid particular stress upon the noise of the escaping gas, although at the time she must have been equally aware of the symbolic meaning, of the gas pipe running horizontally from the wall over her dressing table. Questioned about this the patient retorted, not without a significant show of feeling, that it was the escaping gas and not the pipe which caused death. This was not satisfactory to Reitler. He remarked that the ball and not the revolver causes death, yet in relating that story she had laid all stress on the revolver. He undertook to explain the symbolism of escaping gas in Freudian terms and before he was through there came to the patient's mind a childhood recollection which had escaped her memory so completely that she had not thought of the incident in question even once in the thirty-five years since it happened.

She was about six or seven years of age at the time. One morning she wandered at a very early hour into her parents' bedroom and found them sleeping together. The lower part of her father's body was exposed naked. Much frightened she returned to her room, closing the door behind her so quietly that her parents knew nothing of the incident. She tried to fall asleep but could not. Instead she was thinking persistently of what she had just seen and also of the noise of escaping intestinal gas she sometimes heard from that room. As she lay awake reflecting on these matter she connected the two and gradually built up a whole theory about the manner in which "parents carry out that about which it is not the children's business to know anything." She thought of an apposition of the gluteal regions between parents in bed and an exchange of gases between them as constituting the sexual act.

This infantile sex theory had been completely forgotten. In later years it only appeared "affektdeterminierend" in the patient's suicidal phantasies in which the outrushing gas represented symbolically, according to the writer, the noise of the intestinal gases heard by the child in her parent's bedroom.

Further analysis disclosed a number of other phantasies and symbolic relations around the theme "gas, wind, storm=fecundation." For instance, as a young girl she wished for herself not a "deep and true" but a "stormy" love. Once, on a stormy night she experienced an unaccountable impulse to go into the street and wander about with her clothes loosened up about her so as to expose her body to the fury of the storm. She would thus catch cold and die of pneumonia,—an erotic phantasy masked under a suicidal impulse. In fact stormy weather always brought her enjoyment, "a pleasurable feeling akin to sexual delight."

Perhaps the most remarkable feature about the case is the fact that as soon as this infantile sex phantasy had been thus brought to surface and its rôle in the patient's condition explained to her, she was

completely relieved of her sleeplessness. She removed the unusual precautions against noise around her room and for the first time in many years she was able to sleep. She was even able, for the first time in twenty years or more, to renounce the use of antiphones, and ear stoppers and heavy bandages around her head. The other symptoms also showed a noticeable improvement. The recovery of sleep persisted through the interval between the solution of the trouble and the publication of the report, a period of about ten months. The belief seemed justified that the recovery was permanent.

The author quotes numerous references from comparative religion and folklore to show that, after all, the patient's peculiar infantile sex phantasy in which air, gas, or wind plays such a predominant rôle is not very unusual. In her childish phantasy the patient had built up a theory of fecundation the parallel of which is not uncommon in folklore and mythology. Even Christianity is not free of such phantasies. The bible mentions the appearance of the holy spirit, symbol of fertility, not only under the old phallic form of tongues of flame but also accompanied by storm or wind. The relation between the first breath and life is too obvious not to have been seized upon by the primitive mind; it furnishes a rich theme of phantasy and conjecture in folklore, both ancient and modern. According to a Brahmin belief, Prajapati animated man with his lower breath while his upper breath gave life to the deities. In Eduard Fuchs' *Illustrierte Sittengeschichte* (suppl. vol., p. 289) may be seen a reproduction of the portals of St. Mary's Church at Würzburg and over it will be noted a bas-relief representing "Mary's Conception." It shows God himself in the rôle of father holding between his lips "einen langen Schlauch" the other end of which reaches down to earth and enters the body of Mary. In the Finnish epic Kalevala, the virgin Ilmator is represented as becoming a mother through the agency of the wind. Such notions are common in the folklore of many people.

3. B. Dattner. Eine psychoanalytische Studie an einem Stotterer. *Zentralblatt f. Psychoanalyse,* II., 1911, 18-26.

Emboldened by Stekel's suggestion that anxiety neuroses frequently manifest themselves under bizarre and unusual forms, the author of this communication applied the psychoanalytical method of treatment to a case of stammering which had resisted all other methods of treatment. The success was so rapid as to appear truly marvelous. Although the case had been of many years' standing, only six days of analytical treatment were sufficient to accomplish a cure after years of special treatment by other methods had failed completely.

The patient was thirty-six years of age at the time of the analysis. He thought his condition was due to his being frightened by a large dog when he was about eight years of age. His mother attributed his condition to diphtheria from which he had suffered one year later. The process of analysis was begun without any unnecessary loss of time and proceeded rapidly as the author enjoyed the patient's complete confidence from the very beginning. Without this the result would probably not have been quite so prompt. As soon as the plan of treatment was outlined the patient plunged into the most confidential features of his personal life history, beginning with his earliest recollections. At six years of age he had already been addicted to masturbation; and he had attempted coitus-like relations with his sister, a little girl of four. Soon afterwards his sister died. It produced a painful impression upon him, and ever after the recollection of his deed

brought him many remorseful pangs. He was very pious; yet he did not dare confess to anyone his trouble; and this aggravated his mental condition. Though no one knew his secret, he feared that some day he would be found out and this would mean everlasting scorn and ruin. The memory of his nefarious act stretched like a red string through all the mazes of his life experience.

Here are a few examples of his speech trouble. In reading gender terms, *der* and *die* became *du*, especially when he failed to concentrate his mind upon the task in hand; *ihm* became *ihn;* and *ihr*, nearly always, *ich*. The patient recalled having had the same difficulty during his school period. His trouble evidently began with the pronunciation of particles of speech denoting gender. He confessed that particles like *der* and *die* reminded him of his early misdeed; and whenever they occurred in the course of his speech he faltered and stammered. Gradually the difficulty spread to many other words denoting gender until there was quite a constellation of them. Thus gender-bearing nouns became also the bearers of the secret of his soul and witnesses of his guilt. Every word denoting sex caused him to falter and stammer in his speech. All this was explained to him in Freudian terms and his conscience was assuaged and freed of the burden of self-reproach. The result was that the speech difficulty cleared promptly.

The word *anstossend* also presented difficulty. The patient invariably read this word *angestossen*. Questioned about this, he declared *"er hatte die Empfindung im Leben überall angestossen zu sein."* With this explanation and the author's reassuring counsel this trouble also disappeared.

Under the circumstances it was only natural to surmise that a similar pathogenic memory-complex was at work behind every other word, whose reading or pronunciation presented marked difficulty. Consequently each important troublesome word was taken up in turn; its free associations, and the memory pictures it evoked were analyzed as minutely as possible. Here is an example: *Osterfeiertage*. The patient was able to pronounce this word only after several unsuccessful attempts. Asked about the memories which the word brought to his mind, the patient recalled, for the first time since he had grown up, a painful scene which he had witnessed as a four-year-old boy, on Easter day. He saw his father brutally attacking his mother for having dared to disobey his orders not to have anything to do with her sister who had given birth to an illegitimate child. He saw himself kneeling at the feet of his dearly beloved mother while his father was heaping abuse upon her; and he experienced once more, almost in its original intensity, the hatred of his father which that painful scene had originally evoked. He could still recall the unspeakable epithets and insults although more than thirty years had elapsed, and he had never thought of the sad occurrence in the meantime. The dramatic intensity of the situation was heightened by the fact that he was very much attached to his aunt, an affection which was not without its sex elements, according to the patient's own spontaneous avowal. Also, throughout his life, the patient was extremely devoted to his mother, while towards his father he felt an equally strong repulsion.

A number of other confessions follow, pertaining mostly to the patient's numerous love affairs and his intimate sex experiences. Some of his amorous adventures were carried out under circumstances which weighed heavily on his conscience later. He worried over them, felt he had done wrong and, being of a religious disposition, he feared that punishment in some form would reach him sooner or later.

The lengthy confessions over, the author explained point by point the relation of the various memories recalled to the patient's symptoms and appeased his conscience with proper reassurances. After one week of this treatment, as has already been stated, the speech trouble was overcome completely.

4. N. VASCHIDE. Le sommeil et les rêves. Paris, 1911, 305 pages.

The author of this work had published at various intervals since 1898 a number of papers on sleep and on dreams. After his death, in 1909, his papers were gathered together, and they form the present volume in the *Bibliothèque de la philosophie contemporaine*.

These papers fall into three groups. The first group deals with the subject of sleep proper, and outlines the various hypotheses which have been proposed, notably the circulatory, neuro-dynamic, biochemical, toxic and biological theories. The psycho-physiology of sleep and the rôle of attention are also considered briefly. The second group, also historical and expository, deals with dreams and especially with the experimental sides of the problem. Here are recorded the well-known theories of Maury, Marquis d'Hervey de St. Denis, Mourly Vold and Freud, as well as the particular technique of inquiry upon which these theories are based. The author's own observations and technique are given in the third part. Interesting as they are, most of these observations are not empirically established. When we are told, for instance, that a determination to awaken at a certain hour disturbs sleep and usually leads to one's awaking earlier than the set time we must regard it as an empirical statement, although the author does add that during a sleep from which we wish to awaken at a certain time there is an acceleration of the cardiac beat. We are also told that dreams are lighter and more logical during day time than at night; that the structure of a dream is related to the depth of the sleep; but these are well-known facts.

The commonly accepted belief that 'thoughts fly faster during sleep' is doubted by Vaschide. He claims to have found that a brief period of amnesia occurs immediately upon awakening; it occupies an interval of one-tenth of a second to two or three minutes. This discovery should prove of highest importance in the study of dreams if it can be substantiated. The recollection of a dream within a dream is ascribed to autosuggestion. The volume contains no other suggestions strikingly novel or original. Even the notion of a brief amnesia between the sleeping and the waking state is not new. Vaschide's merit in its connection consists in furnishing, apparently, scientific evidence or sanction for this old belief.

The 'conspiracy of silence' which, according to the plaint of his pupils, surrounded Freud's *Traumdeutung* is certainly at an end. Freud's work is given a prominent place in this volume. Vaschide ranks it, with the work of Maury, as the most systematic and thorough inquiry into the realm of dreams. Vaschide makes a great deal more of Maury's theories than the facts warrant. This may be easily explained as an instance of French bias, perhaps brought about logically enough through Vaschide's greater familiarity with the literature of his adopted country. Maury did not formulate anything like a complete fundamental theory of dreams, such as Freud's. His chief merit lies in a number of keen conservations, but they are far from forming a complete system. We learn from Maury, for instance, that olfactory dream hallucinations are especially common in the prodromal stages of psychoses. Nothing more is said about this matter. A similar

observation by Freud, namely, that the olfactory sense is abnormally developed in neurotics (in his *Bemerkungen zu einem Fall von Zwangsneurose*) is explained by reference to a well-ordered system of psychological notions.

Diametrically opposed to Maury's position that dreams are the product of psychic automatism stands Marquis de St. Denis, another French writer of whom Vaschide is disposed to think very highly. The somewhat eccentric work by St. Denis entitled, "Dreams and How to Control Them," embodies some very ingenious observations, but unfortunately their value is considerably lessened by the circumstances under which the observations were made. The author was interested in finding a method of controlling dreams. The objectivity and accuracy of his observations must have suffered in consequence. Vaschide is convinced that we cannot so much as control the hour of awaking without interfering with the course of dreams; and in a work like that of St. Denis, undertaken with the avowed purpose of finding a method of controlling dreams, it would be difficult to overestimate the influence of suggestion.

But "Dreams and How to Control Them" is not without its merits. It is one of the first works conceived in a scientific spirit which starts with the premise that there is method and meaning to every dream, no matter how complicated, and that we ought to bend our efforts to understand dreams as a peculiarly suitable means of getting at the workings of the human soul. In fact, its author went so far as to maintain that the true character of persons, especially of women, may be perceived more correctly through the understanding of dreams than through a knowledge of their conscious activity. While St. Denis has framed no such fundamental conceptions as Freud's *Traumdeutung* the merit of having anticipated some of its important conclusions belongs to him.

No review of a work on dreams would be complete nowadays without a reference to the author's attitude towards Freud's theories. Vaschide's account of them is sympathetic so far as it goes. Strange to say, in this account the sexual factor is hardly given the import it bears in the original theory. A dream of Ernest Renan, dating from the early sixties, is rescued from the forgotten pages of literature and is psychoanalyzed, but incompletely. The author regrets that Freud's *Traumdeutung* is not better known in France.

5. JOHN MOURLY VOLD. Ueber den Traum: Experimental-psychologische Untersuchungen. Herausgegeben von O. Klemm. Leipzig, Barth, 1910, 435 pages.

We are witnessing an almost unprecedented revival of interest in the subject of dreams, judging by the number of books that have appeared recently on the subject. Certainly not since the early sixties have there been published so many works on the subject at any one time. True, most of these works consist chiefly of historical accounts of the problem; they furnish excellent general surveys and add little that is strikingly new to our knowledge; but there are a few notable exceptions, especially among the books dealing with the experimental side of the problem. Among the latter, Mourly Vold's work deserves to be singled out as perhaps the most thorough and painstaking. It is based on personal observations carried out by the author over a long period of years, also on the observations of a number of students under his direction; and the work is a fair example of scientific perseverance. The results obtained by the author may be adjudged rather scant when

contrasted with the amount of labor they have cost but this only adds to the merits of the author who has chosen such a thankless field for his scientific labors.

A review such as this work deserves would be out of place here; only a few points of special interest from the Freudian standpoint of dream analysis will be noted.

Vold found that in dreams facial hallucinations may be due to sensory stimulation of other bodily regions, just as in the waking state. Any cutaneous-motor stimulation, no matter on what portion of the body it may be located, may give rise to facial hallucinations. These hallucinations are more frequently caused by such peripheral stimulations than by excitations of facial regions directly. In other words, stimuli involving directly the retina or ocular muscles or other portions of the ocular apparatus play only a secondary rôle in the psychogenesis of facial hallucinations. Between the facial hallucinations in either dreams or the waking state and the facial and other hallucinations of psychopathic states there exists, according to this Norwegian writer, a very close psychogenetic relationship. Freudians who have been criticized severely because of their tendency to apply the psychic mechanism revealed in morbid states to the analysis of normal psychic activity will welcome this view as implying a vindication of their position.

Another of Vold's conclusions which will be greeted with a great deal of satisfaction by the pupils of Freud is that concerning the origin of dream hallucinations. He finds that these are frequently built around childhood memories. For the explanation of hallucinations during which objects are seen moving passively through space Vold assumes a special psycho-motor state, a generalized feeling akin to sexual excitation. This is particularly true of the state accompanying the vision of things swaying in space and of dreams in which one finds oneself floating along smoothly or flying through air. Sexual excitation manifests itself in dreams and hallucinations through a peculiar state of muscular tone; it gives a feeling of strength, of muscular vigor and of general well-being not easily described. This is the reason why such dreams are most common during puberty. They are often encountered also during convalescence from disease with the return of the patient's strength and vitality. The paintings representing saints in a state of ecstacy, and many of the so-called spiritistic phenomena belong to this category. Witches and charmers who are represented as riding through space, etc., are hysterical subjects with strong sexual leanings.

6. L. Loewenfeld. Ueber die Sexualität im Kindesalter. Sexual-Probleme, VII., 1911. 444-454; 516-534.

Loewenfeld was among the first writers to oppose Freud, in the middle of the nineties. Unlike others, he did not attack psychoanalytical views in a prejudiced spirit but on the basis of counter-proofs and with scientific arguments. This makes him an honorable opponent and renders his views particularly interesting.

The present contribution is a brief discussion of Freud's theory of infantile sexuality as developed in the *Drei Abhandlungen zur Sexualtheorie*. He wonders how Freud conceived that *das Ludeln* is always an occasion for sexual excitation in children or that onanism is a universal trait of infancy. According to his observations upon children this is not the case; nor are pollution-like excitations as common among children as is maintained by Freud's school.

Concerning the inclination of children to uncover themselves, Loewenfeld states that it is by no means a universal trait, nor need this tendency of children be interpreted in the same sense as the more significant forms of exhibitionism. Why would it not be more simple and equally satisfactory to look upon the tendency of children to uncover themselves as due simply to the pleasurable feeling which freedom from cumbersome coverings naturally gives? In the same way their 'exposure' instinct may be explained without recourse to any fanciful theory as due to the children's natural learning instinct and great curiosity. These traits are universal enough so that it would not be far-fetched to ascribe to them the tendencies which are characteristic of childhood instead of having recourse to very elaborate hypotheses. Children are naturally curious about everything that comes within the reach of their senses. What is more natural than that they should extend the same curiosity to certain regions of their body? Even a certain degree of 'exhibitionism' would be admissible on this score, and would not necessarily imply erotic tendencies.

As to fear, it is by no means certain that it stands in such close relationship to sexuality as Freud would have us believe. Infantile fear may be only the natural consequence of ignorance, the realization of complete helplessness in the presence of the unusual. Freud assumes that the erogenous character of the excretory zones of the body is realized early during infantile life; but Loewenfeld denies that this is frequently the case. According to the latter's experience with children, the erogenous character of these zones may not become manifest earlier than the school age, and even then, the sexual awakening may proceed without any of the portentous consequences described by Freud.

The infantile "*Analerotik*" which, according to Sadger, is the most common form of sexuality in childhood is looked upon with extreme scepticism by the writer.

7. P. NÄCKE. Ueber tardive Homosexualität. *Sexual-Probleme*, VII., 1911. 612-634.

Under 'belated' homosexuality the author conceives the homosexual tendencies which appear late in life in persons who have first experienced hetero-sexuality, or bi-sexuality with the hetero-sexual component predominant.

The author thinks that genuine cases of this kind are rare. The subjects belong to the group of bisexuals. Homosexuality cannot be aroused through improper associations, lewd suggestions of corrupt companions, like other vices; homosexuals are born, though the trait may appear only late. There is no such thing as acquired homosexuality. Most cases which manifest themselves late in life are instances of 'pseudo-homosexuality.' True homosexuality breaks out early. The best guide to a differentiation between the two forms is furnished by the subject's dream life.

These are in brief the author's views on the subject. The case which furnishes this opportunity of discussing them is one of infantile repression, in Freudian terminology. Of course the subject was bi-sexual; the analytical school of psychology recognizes no alternative. It looks upon mono-sexuality as a myth. With the author's view that homosexuality does not necessarily imply degeneration, Freudians will agree; but they will probably refuse to accept the new term which Näcke introduces. What is there really to distinguish his 'belated' homosexuality from the ordinary form? The time of outbreak of a homosexual trait

does not create a new type. Even the term 'pseudo-homosexuality' is of doubtful clinical value. Moreover, its introduction weakens the author's views concerning the psychogenesis of these sexual traits because it implies a serious contradiction. Nothing can be gained by making such hair-splitting clinical distinctions.

8. A. J. Storfer. Zur Sonderstellung des Vatersmordes. Eine rechtsgeschichtliche und völkerpsychologische Studie. *Schriften zur angewandten Seelenkunde*, No. 12, 1911, 34 pages.

Storfer's study of patricide is an application to social psychology of some of the fundamental psychoanalytical principles. It starts with a brief historical account of the development of the notion of crime as a social concept. The author's standpoint is that hunger and love have been the two dynamic agencies which have shaped all associations between men from the earliest hunting groups on, including all family ties. The endeavor to satisfy the primal instincts as thoroughly as possible required a certain economy of action; and this introduced the principle of personal sacrifice for the greater good of all. The passing of the stage which may be described as having been characterized by the *homo homini lupus* rule of action over into a condition in which man learned to act as a *ζῶον πολιτικόν* brought about a certain limitation of personal freedom. The majesty of 'self' was counterbalanced by that of the almightier 'we.' As the various principles of utility shaped themselves the social requirements predominated, and acted as a safeguard against the more circumscribed selfish motives of the individuals as such. Any deed which was deemed by the majority of the group, consciously or otherwise, as detrimental became unsocial and was branded with some distinctive term denoting disapproval, irrespective of individual regard or interests. We have not as yet realized in practice an ideal concept of crime based on the broadest social significance of the term. This remains to be accomplished by an order of society to which true eugenic ideals will be more fundamental as guiding principles than they are in our present social organization.

The old notion that primitive people obeyed commandments and avoided crime because this was in accord with divinely prescribed law has been entirely exploded. Modern science has replaced it with the conviction that every juridico-social or religious prescription was, at bottom, only the projection of some human wish, and embodied the expression of the dominant interests of society at a certain stage in its evolution, such as the family, the group or clan, the caste, the city, the nation or state. Thus legal and religious beginnings have a common history.

Mythology represents the fossilized remains of a social and ethical order whose characteristic traits are older than any period of which we possess distinct historical records. Through the study of myths and primitive religion we learn something about the ways in which our earliest ancestors thought and acted. It was therefore a happy thought to call mythology the palæontology of ethics.[1] The historical value of legends and myths may be small if one considers only the incidents recorded therein as such, but for the reconstruction of old beliefs and ethico-social ideals they furnish an unlimited wealth of material, as has been pointed out, among others, by Bernhoft.[2] This is especially true of mythological data.

[1] Makarewicz, *Einführung in die Philosophie des Strafrechts.*

[2] *Ehe und Erbrecht d. griech. Heroenzeit., Zeitschr. f. vgl. Rechtswiss.*, XI, 322.

A definite conception about religious beginnings must precede any attempt at interpreting the inception and evolution of ethico-legal notions and ideals. If one admits, with Bastian for instance, that the psychological source of religion is fear,—the fear of the many demoniacal powers with which primitive man must have thought himself surrounded,—then one may accept without question the hypothesis that flows from it that "*das Mordverbot sei eine naheliegende Rückwirkung der dämonischen Bevölkerung der Natur und der dämonisch bereits empfundenen Zustände des Seelischen.*"[3] But the author of the present study points out that, among primitive people, fear of demoniacal powers and fear of murder are by no means parallel developments. On the contrary, the killing of an enemy is a virtue, which like many another, springs from necessity. What is more, among some primitive people whose struggle for survival was particularly severe on account of the meager means of subsistence available, economic necessity developed the custom of killing off the old and feeble. In the same way we must look to economic and other social-utilitarian causes for an explanation of the earliest religious and juridical customs and beliefs.

Freud, in recent years, has emphasized again the analogies between individual psychic activity and the mechanism of social psychology and has contributed to the subject a wealth of suggestions, most of which remain as yet to be worked out. In one of his minor contributions entitled "*Zwangshandlung und Religionsübung.*"[4] Freud states: "*Ein fortschreitender Verzicht auf konstitutionelle Triebe, deren Betätigung dem Ich primäre Lust gewähren konnte, scheint eine der Grundlagen der menschlichen Kulturentwickelung zu sein.*" This is in accord with the well-recognized fact that even the earliest forms of religious customs imply a certain sacrifice of individuality. It shows, in general traits, the psychic factors at work in the process of crystalization of religious beliefs. Consider, for instance, the custom of setting aside a portion of land for the use of divinities and the rich gifts and sacrifices to invisible gods while the community is carrying on a precarious existence. These illustrate the inhibition of selfish instincts and show how broader principles of sacrifice to 'higher duties' are introduced.

The heroes and divinities of mythology are surrogates of the people's suppressed wishes and phantasies. Religious traditions illustrate the hidden mechanism of the social mind. This explains why the life histories of heroes and of divinities are rich in unethical incidents and plots of a repulsive nature. Wundt[5] states that 'objectification of the people's own consciousness' is the source of all myth-formation, and that in this process man shifted all his qualifications, even the worst, greatly magnified, upon divinities created for this purpose. The analytical psychology of Freud substitutes for Wundt's objectification of consciousness the 'creative power of subconsciousness,' and maintains with particular stress that no magnification of any traits occurs in the process. The traits ascribed by man to his god, from the best to the very worst, are those which live in his breast, either as remnants of his long past or as aspirations of his own future. In the psychic mechanism of the individual Freud has found that the unwelcome, forbidden wish is transposed and sometimes projected outward and upward. A study of myths and religions shows that the same mechanism is found in

[3] BASTIAN, *Zur Mythologie und Psychologie der Nigritier*, p. 160. In this connection, '*dämonische Zustände*' refers particularly to dream and disease.

[4] *Sammlung kleiner Schriften*, F. Deuticke, Wien, 1909.

[5] *Ethik*, 3rd ed., I., 52.

folk-psychology. Not only do religious commandments and proscriptions represent what is socially undesirable at a given stage in the evolution of society, but the life histories of all religious heroes, from the earliest mythological divinities to Christ, show a transfer 'upward' of what is incompatible with man's sophisticated notions of morality and is therefore forbidden. Consider, for an example, the following instance: People living in an order of society in which the family organization is basal and the powers of the *pater familias* supreme, look upon patricide, naturally enough, as the blackest crime of which one could be guilty, yet they are the very people who represent their divinities as guilty of it.

It appears that among primitive peoples individual life was not valued highly. In a state of society in which war was of perpetual occurrence murder could have not been a very serious offence. Where enemies abound and the struggle for survival is at its keenest, killing in order not to be killed is a necessity. Even before the Marxian materialistic conception of history was formulated, the view was expressed by no less keen an observer than Voltaire, that war was at bottom a question of theft.[6] The occasional snuffing out of a human life could not have been looked upon as a very portentous affair in those unstable days of continuous warfare. The bellicose disposition of primitive people is further illustrated by their well-known mistrust and suspicion of all strangers. There is a deep psychic reason for this. Subconsciously, if not otherwise, every stranger is regarded as an eventual competitor in the struggle for existence or as a possible sexual rival. These are the two greatest motivations of man's earliest struggle on earth; and they have remained largely so to this day. It is interesting to note that a similar subconscious motivation has been ascribed to the child's instinctive dislike for or fear of strangers, and to the similar peculiarities of mental defectives. Their otherwise unaccountable mistrust varies, as is well known, from slight antipathy to marked hatred and a desire to kill the stranger. The friendly reception of strangers is a late development in the evolution of men's relations with each other, a distinct mark of sophistication. It was a natural sequence of the development of commercial exchange and similar pursuits. With the custom of exchange the first substantial step was taken towards the internationalization of law; it marked the beginning of the transfer of *hostis* into the quality of *hospes*. Indeed, it is not by accident that the words *host* and *hostile* are traceable to the same root. This change had a tremendous influence upon the course of social progress. For one thing, it introduced, besides the notions of 'I' and 'we,' a third, 'host,' belonging to the same category. Henceforth a host could also enjoy certain rights and privileges in the midst of the social group; not all strangers were alike enemies.

The principle of unlawful murder within the community must have been introduced by way of contrast between the rights and privileges of the 'classes' or categories mentioned. If the *host* appeared in the quality of *hostis*, or was adjudged thus, during turbulent days of warfare and reciprocal suspicion between allied groups, it was no doubt proper to kill him. But the sanction of the group probably did not extend to the murder of other members within it, except, of course, in those instances where lack of food supply or similar conditions made the removal of such unproductive members as the old and the feeble a desirable measure of relief and the custom of killing them off grew

[6] This expression was paraphrased by Proudhon in his famous definition of private property: *'La propriété c'est le vol.'*

as an ethico-religious ceremonial. But there was one form of murder which must have been guarded against by all the means at command in those days, namely the killing of the chieftain, the man in whom centered all the social authority, all the power and prestige of the group. An attack upon him meant an attack upon the whole community; it savored of a social calamity. Such a crime must therefore have stood out as the blackest imaginable. The deed was nothing short of treason. To this day, treason is still the highest crime of which a man may render himself guilty, and it calls forth summary punishment. Garofalo calls it the natural crime. The moral difference, where the physical deed was similar, must have been perceived in some way even by those primitive men to rest in the relations between the agent of the crime and his victim. In that stage of society in which the family was the social unit, forming a sort of state on a small scale, and the larger community was but an aggregate of such states, with the father in each as the head, rebellion against him must have been looked upon as the equivalent of political treason and patricide must have been of all forbidden deeds, the vilest crime. Even after the family ceased to be autochthonous and was succeeded by other forms of social order, the old odium attaching to patricide must have survived in folkthought, especially in communities, like Rome, in which the family continued to be, in many respects, the basis of the whole social organization.

With the *pater familias* representing the powers of the state and patricide political murder *par excellence*, the killing of the father, was probably the first publicly forbidden form of murder. History, archeology, ethnology, jurisprudence and the psychology of the subconscious mind of childhood bring evidence from widely separated fields substantiating this point. The particular forms of prohibition and the formulation of preventive and punitive measures can be understood only in connection with the economic and other social conditions of the respective people, and on the basis of analytical psychology.

Two very significant facts may be mentioned as illustrating these principles and their wide range of application, when considered in conjunction with each other. Among the earliest politico-religious regulations of the Babylonians, Assyrians, Egyptians, Greeks, Romans and Chinese alike (and almost every other nation that might be mentioned) we find specific and unusually severe punishments provided for offences against the head of the family, that is, the father. On the other hand, it will be found that the gods of all these nations have been represented as guilty of all kinds of offences against the father, including murder. Moreover, there are legends among many Indo-European peoples of occurrences in which the son drove the father from the seat of power in the family and usurped his place. The most precious possession that went with the coveted place was woman. Nor is it easy to distinguish between the chief wife, the concubines and the slaves of those times. At any rate, among the Indo-Europeans it was not uncommon for the son to inherit his father's concubines and women slaves, even if traces of his marrying also his father's chief wife, that is, his mother, are not so frequent. Certain it is that among the Lithuanians and Prussians, for instance, the son was not forbidden to marry his step mother and this custom of intermarriage between children and foster parents was also known among the Anglo-Saxons.

Thus yearning after power and particularly for the sexual privileges which it brought were the psychic motives which led to patricide in the early cultural states of society. Kohler[7] makes a comparison which

[7] Holzendorfer-Kohler, Enzyklopaedie, I., 6.

throws a flood of light on the biologico-psychic origin, import, and consequences of changes in social control when he states that '*Jedes Recht ist ein Oedipus der seinen Vater tötet und mit seiner Mutter ein neues Geschlecht erzeugt.*" Kohler's reference to the Oedipus myth was incidental; but the analytical psychology of Freud insists that it is more than a figure of speech. That it embodies a literal truth. The Oedipus myth represents the incest phantasy of a nation, and is a paradigm which furnishes an important starting-point for the psychoanalysis of the relations between children and parents. "Many men there are," runs a remarkable statement in the Oedipus tragedy by Sophocles, "who have seen themselves in dreams mated to their mothers." Thus incest phantasy is openly recognized by the Greek mind. The plot of Shakespeare's Hamlet is also believed to rest upon an incest phantasy.[8]

The rivalry between father and son, the young hero and the ugly king, furnishes the plot for many myths and folk-stories among the most varied nations. This is only natural to the naïve mind of primitive people since the patriarchal family-state was not the earliest form of family organization. It was preceded, as is well known, by hetærism (promiscuous, or clan marriage) and by the matriarchal form of organization. No wonder that incest phantasies are universally distributed and regularly projected or transferred by the people to their deities and mythical heroes. Every one is familiar, for instance, with Caesar's statement about the Britons, in his *De Bello Gallico: "Uxores habent . . . inter se comunes . . . parentes cum liberis."* This promiscuity was stopped only by the advent of the patriarchal form which also led ultimately to monogamy. But such a radical change in the sex relations between the members of the family or clan, was not possible without strong psychic repressions. Custom and law, religion and superstition enforced the new order and added force to the psychic repressions. One of the formal results of this was that members of the families became sophisticated; filial piety, especially toward the father, came to be looked upon as a particular virtue. Still, early infancy is free from it, for, as Lafontaine has said, "*cet age est sans pitié.*" According to certain recent Freudian deductions, this should be found to be true also of the early age of nations.

In the patriarchal state the manifest glory and power of the *pater familias* consisted chiefly in his sexual privileges; these, at an earlier period, had been shared by all the adult males of the family more nearly alike, hence the sense of rivalry between father and son, hence the incest phantasies, the symbolism of childhood, the dreams representing patricide. Hehn's report in his "*De moribus Rhutenorum,*" of a young man who told with considerable pride that his bride had been rendered pregnant by the Batjuschka, the master, his father, is very significant because it throws additional light on some possible privileges of the *pater familias* during the patriarchal state and indicates his absolute powers. It is quite possible that the land master's much discussed *jus primae noctis*, during the later, feudal-economic state, may have been a remnant of the original privileges of the *pater familias*. Indeed the land-lord exercised the same absolute rights over his community as the *pater familias* of old over his circle; in a certain sense his was a makro-family over the members of which he held the same despotic powers.

[8] "*Hamlet ist ein Eckpfeiler in der Entwickelungsgeschichte von Recht und Sittlichkeit,*" Kohler, Shakespeare vor dem Forum der Jurisprudenz, p. 189. See also Ernest Jones, Das Problem des Hamlet und der Oedipus Komplex.

It is interesting, in this connection, to note that *pater* and *πατήρ* mean originally the master, he who nourishes, and not father in the modern sense. This may be seen further from the relation of this term to *potestas* and *δεσπότης;* In other words, during the patriarchal family organization the biological rôle of fatherhood was rather obscured by the juridico-social function. The master and head of the family was surrounded by special protective regulations, under the sanction of custom and religion. These were measures of state, directed against treason within the social body. It is extremely characteristic that *ἄγος* treason is the very term with which Kreon brands the action of Oedipus who kills his father and marries his mother.

If we turn to modern political crimes, plots, treasons and regicides, we find a strong and hitherto unexplained connection between the sexually motivated family conflicts and strife on the political field. Let this example suffice: One of the greatest epidemics of political murders in modern times was that which accompanied the rise of Russian nihilism. All the authentic documents that bear directly upon this movement indicate that it was as much a rebellion against old family conditions as against the old form of government. Turghenieff wrote a novel which was the first to give expression to the nihilistic tendencies of his day. In fact this is the work in which the word nihilist occurs for the first time. The Russian revolutionary youth borrowed from this novel the term which they applied to themselves and their movement. The title of this novel is *'Fathers and Sons.'*

Roman Patricide. The oldest Roman document referring to murder is the statement by Numa Pompilius: *'Si quis hominem liberum dolo sciens morti duit, paricidas esto.'* Why a murderer should be thus branded as a patricide is a problem which has led to endless controversy. A review of the etymological discussion of this expression, supplemented by an analysis of what historical documents are available, leads Storfer to the following conclusion: In the earliest times patricide probably meant the killing of any member participating in the sexual life of the social group; in patriarchal times this term was restricted to the murder of the head of the family; since Numa Pompilius it was again broadened to include the murder of any free citizen; and after the Roman republic it was once more restricted to mean the assassination of blood relations.

Animal symbolism in the Roman ritual of punishment for Patricide. For patricide, occasionally for the killing of other blood relations, the traditional punishment towards the end of the republic at Rome and during the imperial age was the *poena cullei:* the murderer was sewn up in a sack together with a cock, a dog, an ape or a snake and thrown into the ocean. This curious custom points to an early sexual implication of the offense. It is no doubt a survival of the early period when the sex factor was preëminent in the motivation of the deed.

It is well known that punishment and sacrifice, legal ceremony and religious symbolism, stand in very close relationship, having had a common origin. The Latin term *supplicium,* for instance, means *sacrifice* and also *capital punishment.* Every punishment is a ceremony motivated formally by the desire to appease the wrath of some deity who may have been offended through the deed but the ceremony also roots psychically in a deeper motive, namely, the satisfaction of the punishers themselves who in this manner abreact their own pent-up feelings. The ceremony, whether sacrificial or punitive, whether religious or legal, has the same object from the standpoint of social psychology, namely, the reëstablishment of psychic equilibrium. The cere-

mony is as complex and as impressive as the repressed phantasy complex to be abreacted is strong and deeply rooted.

He who kills his father is thrown into the ocean so that he may never reunite himself with mother earth, after being first sewn up with a dog, cock, ape or snake—symbol of the sexual import of his deed. Every one of these living creatures stands for sexuality in folklore, myth and religion. Storfer quotes numerous references from these three sources to illustrate this point. He concludes as follows: *"Dadurch, dass Hund, Hahn, Affe, und Schlange mit dem Vatermörder ins Meer geworfen wurden, dadurch, dass ihre Vereinigung mit der Muttererde verhindert wurde, sollte also die Empörung gegen die patriarchalische Gewalt, die Auflehnung gegen die sexuelle Omnipotenz des Vaters, der psychologische Rückfall in den Hetärismus gerichtet und gesühnt werden"* (p. 33).

9. F. Wittels. Tragische Motive: Das Unbewusste von Held und Heldin. Berlin, E. Fleischel & Cie, 1911, 165 pages.

In such works as Abraham's *Traum und Mythus,* Rank's *Geburt der Holden,* Ricklin's *Wunscherfüllung in Märchen,* and Storfer's *Sonderstellung des Vatermordes,* the results of Freudian analysis of the mechanism of individual psychic activity are applied to the study of phenomena of a psycho-social order. This is done on the reasonable assumption that the working order of the 'social mind' is at bottom governed by the same rules as the mind of the individual.

The present work by Wittels, author of the excellently written volume entitled '*Die sexuelle Not,*' represents a similar attempt to apply the analytical data of Freudian psychology to the field of letters and specifically to the motivation of dramatic plots. Wittels starts from the premise that the transfer of affects is a most common psychic occurrence. He also accepts the whole Freudian notion of the subconscious. With these two hypotheses as a basis, he formulates a rule which is to explain the psychic motivation of plots, practically as follows: The cause of all tragedy is the break into consciousness of the illogical and unethical subconscious self.

This broad generalization is illustrated and reiterated by references to many of the world's best known literary and dramatic plots. Brutus kills Caesar not on account of his great love for freedom, but because of his subconsciously acting hatred towards his father, his sexual rival, his mother's 'betrayer.' Rhodope condones the killing of Kandaules and then dies. The apparent reasons for this tragedy are humiliation and revenge. But psychoanalysis alone reveals the true reason: Kandaules became the surrogate, the bearer of Rhodope's subconsciously motivated phantasies and wishes. His death symbolizes her realization that she must part with them; hence his murder and the true motive for the tragedy. In like manner is to be explained Kandaules' act of exposing Gyges before his wife Kandaules does this not out of sheer recklessness; he is led to the act by motives which he himself does not realize. The truth is that his wife had lost all charm for him, and Kandaules was prompted subconsciously to create an embarrassing situation for her,—a situation that may prompt her to commit a serious breach of marital ethics and furnish him with grounds for separation. Medea kills her children; again the formal reasons appear to be jealousy and revenge. But the real, subconsciously active, psychic motive is Medea's wish to be once more as young, pretty and attractive as when Jason first knew her. Why are such men as Macbeth attracted to women like Lady Macbeth? Because men who, for any reason, have

subconscious inclination to murderous deeds are always attracted by women capable of fanning their hidden tendencies which clamor for expression into an uncontrollable impulse so as to become abreacted. Such women as Judith, Charlotte Corday or Joan of Arc are impelled to deeds of heroism by suppressed erotic impulses. The political and patriotic reasons are merely formal. The true motives are hidden deeply in the subconscious. In the same way, religious devotion and saintliness are but a vein for latent sex impulses, a mask under which these are given free rein.

These and similar explanations are some of the consequences of the author's generalization. It will be seen that his formula is broad enough to be applicable to every known plot in the world's literature; but it may be that its very breadth divests it of concreteness. Moreover, the rule is applicable only in the presence of morbidly intensified psychogenic complexes. That is, we must first have the annoyed husband, the hysterical, love-longing wife, the Oedipus-complex, before the rule works. It would appear that after all, this formula is but a restatement, in hypothetical terms, of certain facts which had hitherto been stated in language more appropriate to their formal aspect. Whether anything is gained thereby and particularly whether any real light is thrown upon the psychogenesis of dramatic plots by this theory the reader must decide himself from the outline which has just been given. The reviewer's attitude remains '*rein referierend*' for the present.

The reader may raise the question: Are we to infer that it is the dramatist's intention to depict that which Wittels sees in his creations? Or is Wittels' merely a view-point from which we may encompass the whole field of drama, irrespective of the dramatist's intention? In the last analysis it really does not matter one way or another. The dramatist is a man of deep vision, not a scientist; he may have been led subconsciously to depict struggles and situations whose real import escapes even his understanding. This is not uncommon. But whether this be so or not, the value of the dramatist's works as documents for psychoanalytical study remains the same.

A special chapter entitled "Hellas und Hysterie" discusses the problem as to whether the Greeks of the classical period were subject to hysteria. This chapter contains very excellent suggestions. The question itself is answered in the negative. The author states that the Greek theater alone provided a thorough channel for discharging pent-up subconscious motivations and was enough to keep the Greek mind in a healthy state and specially free from hysteria. For the Greek the stage was '*ein Hort der psychischen Gesundheit,*' a most precious safety valve such as the modern citizen scarcely possesses. It is a mistake to look upon the Greek drama as at all symptomatic of the Greek mind. On the contrary, it shows what the citizens of Greece escaped just because they possessed this means of abreacting their phantasies. We are inclined to look upon Greek tragedy as peculiarly strange. The unfamiliarity of its spirit is due to the fact that we are too much addicted to hysteria, '*wir leben mit ihr in Symbiose.*' Having succeeded in suppressing all unwelcome instincts far beyond easy recall, the heroes of Greek tragedy, bearers of our own subconscious motivations though they be, appear nevertheless to be strange creatures with whom we have nothing in common. As a matter of fact, if we were as frank a people as the Greeks were we should recognize a great part of ourselves in the heroes of their drama. A true understanding of drama is furnished only by the sympathetic rapport between the sup-

pressed longings and phantasies of our subconscious stream and the heroes of the stage. Every great tragedy represents before our eyes the demons of our inner self; and it is for us to be honest enough to recognize our identity with them. Therein lies the true appreciation of drama, the great virtue of the Aristotelian principle of aesthetic catharsis. But having become more and more interested in the formal and conscious side of our existence and having therefore wandered away from our inner self we moderns lack the clear understanding of the human soul which distinguished the naïve Greek mind; hence our inability really to appreciate Greek tragedy. Our civilization has carried us far away from that state in which man realized himself as a child of nature. We have become too sophisticated. This is the reason why the Greek stage seems no longer to hold up the mirror of nature to us.

A NOTE ON THE DETERMINATION OF THE RETINA'S SENSITIVITY TO COLORED LIGHT IN TERMS OF RADIOMETRIC UNITS

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About a year ago[1] the writers undertook to determine the retina's sensitivity, relative and absolute, to colored light in terms of units that can be compared. Since several years will be required to complete this work, they have thought it best to publish a preliminary note showing briefly the purpose and scope of the investigation. The following points will serve to indicate what is being attempted in this study.

(1) All measurements of sensitivity will be made in radiometric terms. This will give an expression of the sensitivity of the retina in units which are directly comparable with one another. At present we have no direct estimate of the comparative sensitivity of the retina to the different colors further than is expressed, for example, by the relative width of the collimator-slit that has to be used to arouse color sensation when a light-source of a given candle-power is used. This kind of comparison is obviously unfair because such different amounts of energy are represented from point to point in the spectrum that a given width of slit would admit many times the amount of energy at one part of the spectrum that it would at another. In short, no adequate estimation and expression of the retina's sensitivity to color, comparative or absolute, can be made by means of the methods now in common use.[2]

[1] The first public statement of our intention to use radiometric units in the investigation of the retina's sensitivity to color was made to the committee in charge of the Sarah Berliner Research Fellowship, February 1, 1911.

[2] Two criticisms have been received from private sources which it may be well to take account of here. In one the possibility of a point of view is implied, in the other a point of view is stated. The point of view, the possibility of which is implied in the first criticism, is that it is not proper to estimate the sensitivity of the retina in terms of physical units, because it is generally conceded by modern investigators of color vision that the retinal processes which transform the physical energy of the color stimulus into nervous energy is essentially chemical in its nature; and one can not assume that a certain amount of physical energy arouses an equal amount of chemical energy in the retina, or that equal amounts of physical energy arouse equal amounts of chemical energy. In answer to this, the writers would point out that these chemical substances are a part of the retina and their respective iner-

(2) Comparisons of results on many other points with such disparate stimuli seem equally inadequate: the relative time required for the different color sensations to attain their maximum of intensity, or retinal inertia; the relative rate of fatigue to the different colors; after-image and contrast sensitivity, etc.[3] In fact there is not a quantitative problem

tias constitute one set of factors that determines the sensitivity of the retina to the different colored lights. It is not necessary to assume, therefore, that a given amount of physical energy arouses an equal amount of chemical energy, etc., in order to make our determinations of the comparative sensitivity of the retina to the different colors in terms of physical units. That would be necessary only if we were trying to separate out the nerve filaments, and to measure or compare their sensitivity to the different colors in terms of physical units. But even in chemical theories when speaking of the comparative sensitivity of the retina to the different colors, we do not mean the comparative sensitivity of the nerve filaments alone. We include the reaction of the chemical substances as well. Our contention, then, is that if the determination of the comparative sensitivity of the retina to the different colors is a proper problem, the determination should be made in terms of quantities that can be compared. This can be done either *a*, by using lights equalized in energy and determining by means of a sectored disc the relative amounts of these lights that are required to arouse sensation; or *b*, by using lights representing different amounts of energy and measuring directly in terms of radiometric units the amounts required to arouse sensation. We scarcely need point out that in speaking of the comparative sensitivity of the retina to the different colors we are not raising a new problem, but are merely recognizing a very old one.

The second criticism is in substance that a quantitative comparison of the effect of the different wave-lengths on the retina is improper because the different wave-lengths constitute stimuli too different in kind to permit of such comparison. This criticism we leave open, because we do not wish to discuss in this paper the propriety of the problem of comparing sensitivities.

[3] It is conceivable that two points of view may be held with regard to what is meant by after-image and contrast sensitivity. (1) After-image and contrast sensitivity may express a relation between the amount of light required to arouse after-image and contrast sensations and the unit of light used. (2) It may express a relation between the amount of light required to arouse the after-image and contrast sensations and the amount required to arouse positive sensation. If the former view should be held it will be convenient to start with stimuli equalized in energy, and to determine the relative amounts of light required to arouse the after-image or contrast sensation by means of a sectored disc. If the second view should be held, the energy of the lights used may first be rendered proportional to the sensitivity of the eye to the colors in question; and the liminal values may then be determined by means of the sectored disc. In each case the relative sensitivity may be expressed by the inverse ratio of the open to the closed sectors.

Similarly two views may be held with regard to the determination of the comparative rates of fatigue, and of the development-time of sensation. (1) Lights equalized in energy may be used. (2) The energy

dealing with the comparative functioning of the retina to the different colors in which there does not seem to be a need for the regulation and estimation of the stimulus in terms of a common unit of measurement. It is the purpose of the writers to extend the work as fast as possible into these related fields.

(3) We wish to make a careful study of the sensitivity of the peripheral retina, quantitative[4] and qualitative, in a large

of the lights may be made proportional to the sensitivity of the eye to the different colors.

The need in both the above cases is equally great for a method of regulating and determining the amounts of light to be used in terms of a common unit of measurement.

[4] The following are two of the points we wish to take up: (1) A determination will be made of the ratio of sensitivity of peripheral to central retina from point to point for a single color in several meridians. This will show at what rate the retina falls off in sensitivity in a single meridian, and how uniform this decrease is in the different meridians. We have found in a preliminary study that this knowledge is greatly needed in explaining certain phenomena of the peripheral retina. Furthermore, when this determination is made for each of the colors with which we wish to work, the ratios of sensitivity for these colors at all the points can be calculated and a definite answer can be given to the question whether or not uniformity of ratio obtains throughout the retina. This question has been given considerable importance in the discussion of color theories. (2) The limits of sensitivity will be investigated. In general two problems are involved here. (a) The limits may be considered in relation to the comparative sensitivity of the retina to the different colors. (b) They may be considered in relation to existing color theories. In the first of these problems the limits should be obtained with stimuli equalized in energy. So obtained the results will constitute merely another expression of the comparative sensitivity of the retina to the different colors. The second problem is more complicated and will later be made the subject of a separate paper. A word indicating its relation to our present plan of work may, however, not be out of place here. It may be logically assumed, for example, that the Hering theory demands that wherever the blue-sensing substance is found, the yellow-sensing substance must also be found. We have no means of knowing where these substances are except by the sensations aroused. Speaking in terms of the theory, then, we have a right to assume that wherever the blue sensation can be aroused the yellow sensation should be able to be aroused also, provided a sufficiently intensive stimulus be used. If, therefore, in passing towards the periphery of the retina, a point be found where blue can be aroused and yellow can not, the evidence will be strongly in favor of the conclusion that no yellow substance is present, unless it can be shown that elsewhere in the retina so much greater energy of yellow light than of blue is required to arouse sensation that the amount needed for this far peripheral point is greater than can be obtained. To establish this point the comparative sensitivity to these colors would have to be obtained at various points in the retina. This would involve the determination of a ratio based upon the amounts of blue and yellow light required to arouse sensation. Two methods of measurement may be used. (a) The amounts needed may be measured

number of meridians. In general too much uniformity has been assumed with regard to the sensitivity of the peripheral retina. Generalizations of great importance to color theory have frequently been based upon the results of work in which careful investigation was made in only one or two meridians. The conception of stable colors, and its application in support of the Hering *Urfarben* may be taken as a fair example of a sweeping conclusion which is based upon work too limited in its range. With a careful standardization of factors, an investigation in any considerable number of meridians shows that stable colors do not exist.[5] Many other points of interest have come out in our more detailed study of the peripheral retina. For example, we find in the periphery of the normal retina small areas which are exact replicas of the Schumann case of color-blindness.

(4) We wish to conduct our investigation in full daylight instead of in the dark room. This is to eliminate the influence of the field surrounding the colored stimulus and of the pre-exposure. When the surrounding field is black, white is induced by contrast across the stimulus color. Since the colors all differ in brightness,[6] the induction takes place in different amounts for the different colors. This white, in proportion to its amount, reduces the action of the colors on the retina. Further, a given amount of white affects to

directly by means of a thermopile of the type we use, or other sensitive radiometer. In a determination of limens the number of readings required would render this method tedious. (b) The energy of the two lights may be made equal by means of a thermopile and the final amounts required to arouse sensation may be secured by means of a sectored disc. From the ratio of open to closed sectors the amount the light is cut down in each case may be calculated and the ratios of energy may be determined from these amounts.

[5] The following points are offered in support of the above statement. (1) A red and green cannot be obtained which in every meridian of the peripheral retina will pass into gray without an intermediate change into yellow or blue. (2) The amount of blue that has to be added to a mixture of red and green to produce gray varies from point to point in a given meridian even where the extra-macular region alone is considered. Further, a series of determinations made for a given meridian will not hold for the remaining meridians. (3) A red, green, and yellow can not be obtained which will not change in color-tone in passing from the center to the periphery of the retina in a single meridian.

Blue alone of the four principal colors is stable in tone for all parts of the retina.

[6] In a later paper one of the writers (Rand) will show that it is of no advantage to equate in brightness in determining the limits of color sensitivity, and that harm results in so many ways from the attempt to equate that it is doubtful whether it should be done even in determining the limens of color in the more sensitive parts of the retina.

different degrees the action of the different colors on the retina. To eliminate this twofold unequal action, the surrounding field should be made in each case of the brightness of the color to be used. This can be done by working in a light room of constant intensity of illumination and making the surrounding field of a gray paper of the brightness of the stimulus color. In order to accomplish this, and at the same time be able to work upon any meridian of the retina we choose, we have constructed a special piece of apparatus which we call a rotary campimeter. The influence of pre-exposure is even more important than of surrounding field. If the pre-exposure is to black, white is added as after-image to the stimulus color. The effect of a black pre-exposure upon the stimulus color is greater than the effect of a surrounding field of black, because more white is added as after-image of pre-exposure than is induced by contrast from the surrounding field. This effect also can be eliminated only by working in a light room of constant intensity of illumination and by choosing as pre-exposure a gray of the brightness of the color to be used.

We began a quantitative study of the factors that influence the sensitivity of the retina to color three years ago. With the control of factors we had at that time, we could not, for example, duplicate by several degrees at any two consecutive determinations the limits of the zone of sensitivity to any color. The result of our study has been that we are now able with a given light-source to duplicate, within a degree, the results obtained at a previous sitting. We can also duplicate, almost as closely, the threshold values or the amounts of light required to arouse color sensation in the more sensitive parts of the retina. Details of this work will not be given here. They will appear in a series of papers to be published in the course of the present year.

Having completed our work of standardizing the factors extraneous to the source of light, we are trying now to secure a better control of the source. Standardization, so far, can be considered successful only with regard to the quality of the light. No adequate work has been done upon the standardization of the quantity of light. We believe this can be accomplished only by means of energy determinations. We expect to do our radiometric work by means of a surface thermopile (Coblentz model), and a DuBois-Rubens *Panzergalvanometer,* unless future results show that some other combination of radiometer and galvanometer is more satisfactory.

BOOK REVIEWS

Creative Evolution. By HENRI BERGSON. Translated by A. Mitchell. New York, Holt & Co., 1911. xv+407 p.

In view of the numerous reviews and other discussions of Bergson's *Creative Evolution*, the appearance of this translation is hardly a sufficient justification for another extended and detailed exposition of the work. All students of philosophy, however, will be glad to see that Bergson is being made more accessible to the English-speaking public, particularly when the work of translating is done so successfully as in the present instance. That the translator has brought to his task a proper sense of the obligation which he had assumed is evident from the fact that he has combined so well the demands of accuracy with Bergson's well-known felicity of style. The service to philosophy is all the greater from the timeliness of the work.

Aside from its intrinsic merit, Bergson's *Creative Evolution* is of peculiar significance at the present time because it makes prominent an element in the pragmatic movement which requires just such emphasis as Bergson gives to it. The pragmatic attack on rival theories that has been going on of recent years has undoubtedly been lacking in some of the aspects of organized warfare. To a considerable extent the assaults have been determined by the tastes and predilections of the individual leaders. Sometimes it is the question of truth that is put into the foreground; at other times it is the fact that experiencing or knowing works a change in its object; or again it is the dictum that man is the measure of things. These different topics are of course far from being unrelated. But the peculiar intimacy of their union, and at the same time their compatibility with the belief in an external world along the general lines of naïve realism has not been brought out as fully as the case permitted; and hence an air of subjectivism and paradox has hung about the pragmatic position. It would scarcely be correct to say that *Creative Evolution* is a conscious attempt to remedy this defect. But at all events, the emphasis of Bergson's discussion is preponderantly on the 'objective' side; and moreover his treatment of duration may serve as a convenient means wherewith to correlate and unify the pragmatic point of view.

That duration is a real fact is in itself scarcely a novel doctrine. In Bergson's hands, however, this fact becomes alive with new vigor and with added significance. That the past is prolonged into the present and abides there, actual and acting, not only furnishes us with the clue to the errors of other systems, but it enables us to pool our mysteries and our epistemological perplexities in the one inclusive fact that Becoming is more fundamental than Being. As a rule, the insistence that duration is real has not prevented thinkers from taking away with the left hand what was previously bestowed with the right. A consistent treatment of duration from this standpoint necessitates a radical reconstruction of our theories concerning the relation of consciousness and object, a reconstruction that has never been rigorously carried out in the past. If we hold, for example, that the character of duration is such as to compel the belief that the past is in some sense

projected into the present, our recollections of the past are evidently put on a wholly different footing. According to Bergson, "the very basis of our conscious existence is memory, that is to say, the prolongation of the past into the present, or, in a word, duration acting and irreversible" (p. 17). In order to recall the past, then, it is neither necessary nor possible to copy or apprehend a pre-existent reality, for theories of this sort ascribe to the past, by implication at least, a finished character which abolishes what is essential in duration. Nor have we need of resort to a transcendental unity which holds together in eternal completeness the constituents of the temporal process, since such a unity likewise nullifies time. As James says: "Reality *falls* in passing into conceptual analysis; it *mounts* in living its own undivided life—it buds and bourgeons, changes and creates. Once adopt the movement of this life in any given instance and you know what Bergson calls the *devenir réel* by which the thing evolves and grows." And he adds that "philosophy should seek this kind of living understanding of the movement of reality, not follow science in vainly patching together the fragments of its dead results." (*Pluralistic Universe*, p. 264.)

This standpoint, furthermore, provides the answer to the question how it is possible to know a pre-experiential reality. Our human experiences may be viewed as the culminating points in which are merged the pre-existent enduring processes of the real that lead up to them. Within those experiences we find that onward rush, that all-penetrating change, without which time is naught. Because time is of this character, we can take our stand within our experiences and make affirmations regarding the events which occurred prior to all experience. Our experience is immersed, so to speak, in the flux of things: it is not a function that dwells apart in order to take photographic note of mundane events. Our experiences testify to a past and a future from which they can be separated only by abstraction. The apparent difficulty as to how our knowing can produce a change in things without thereby falsifying its data is, therefore, no genuine difficulty at all. It is simply a special phase of the question as to how anything can change without losing its identity as a result. Before this question our logic is helpless, since it is obliged to abstract and to fixate its material before it can proceed. But the real is constantly solving the puzzle which our logic declares to be insoluble, since it maintains the supremacy of Becoming over Being and enthrones change and flow at the heart of things. If Becoming is in any true sense our final category, it is clear that we must look to the end in order to understand the beginning. The necessity of interpreting things in terms of our human experience is not a limitation or a concession to our finitude and impotence, but is a condition imposed by the real itself. To quote James again: "Undeniably something comes by the counting [of the stars in the 'dipper' constellation] that was not there before. And yet that something was *always true*. In one sense you create it, and in another sense you *find* it. You have to treat your count as true beforehand, the moment you come to treat the matter at all." (*The Meaning of Truth*, p. 94.)

Bergson's view, moreover, forces him to the conclusion that knowledge is of a 'practical' character. Since the real is in incessant change, the only way in which we can know it is to have the living, changing experience. Logical analysis inevitably changes its nature. We murder to dissect. In order to control our experiences we endow certain features of them with a permanence which is not theirs by inherent

right. The truth of our conceptual thinking is therefore necessarily relative to the end which we have in view at the moment. "If the intellect were meant for pure theorizing, it would take its place within movement, for movement is reality itself, and immobility is always only apparent or relative. But the intellect is meant for something different. Unless it does violence to itself, it takes the opposite course; it always starts from immobility, as if this were the ultimate reality; when it tries to form an idea of movement, it does so by constructing movement out of immobilities put together" (p. 155).

This contrast, however, between movement and immobility may lend itself to misinterpretation. Since thought is unable to grasp Becoming or duration, we seem to have here a peculiar opposition between thought and immediate experience. Yet the assertion that "movement is reality itself" presumably is not to be taken in the sense that movement is always an experienced fact wherever there is any experience at all, but that when we reflect upon our experiences we are obliged to assert the "reality" of the movement, even though our attention may not have been directed to the movement at the time. Movement is real in that it is "true" for all experiences. Until there is occasion for reflection, neither Becoming nor Being need be experienced as such. In other words, the concept of Becoming is as much a tool as is any other concept. Becoming or duration is more fundamental than static being, in that it is the concept which must be employed when we reflect upon the procedure of the sciences and of every day thinking and attempt to reconstruct our data so as to harmonize and unify our knowledge.

It should be added, in conclusion, that in these brief comments the bearing of the principles laid down in *Creative Evolution* upon current questions is stated rather more directly than is done by Bergson himself. Moreover, a great deal that is interesting and significant in his exposition is necessarily omitted from consideration here. There can be no doubt that Dr. Mitchell's excellent translation will secure for the author a circle of readers more nearly commensurate with his importance for present-day thought.

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The Baganda: An Account of their Native Customs and Beliefs. By the Rev. J. Roscoe. London, Macmillan & Co.; New York, The Macmillan Co., 1911. pp. xix., 547. Price $5 net.

The Bantu kingdom of Buganda, now one of the five provinces of the Uganda Protectorate, lies on the northwest shore of Lake Victoria Nyanza. It fills a troubled chapter in the colonial history of the last quarter of the nineteenth century; and the name of its last great king, Mutesa, is familiar—in the puzzling form M'tesa—to every one who has dipped into the story of African exploration. Mutesa reigned from 1857 to 1884; it was he who welcomed the Zanzibar Arabs and from their example reclothed and rearmed his subjects; it was he, too, who received Speke in 1862 and Stanley in 1875, and who through Stanley appealed to the people of England for missionaries. Mr. Roscoe, himself a missionary sent out by the C. M. S., tells us in his preface that he spent twenty-five years in the country. He must, then, in all probability, have arrived in Buganda before Mutesa's death and the murder of Bishop Hannington; he must have witnessed the coming of Lugard with Sudanese and sleeping-sickness in 1891; and he saw the final reconstruction of government and administration effected by Sir Harry Johnston in 1899 and the following years. Of all these things the

book tells us nothing; recent history is summed up in a few bare paragraphs on pp. 229 f. Mr. Roscoe's interest lies elsewhere. He is a friend and pupil of Professor J. G. Frazer, and he has utilised his leisure, during the last eighteen years of his missionary life, in gathering notes upon the social and religious life of the Baganda before the kingdom was thrown open to foreigners. His information has been gathered from the older men, who neither knew English nor had come into contact with Europeans; and he has received very material aid from the regent and prime minister of the province, Sir A. Kagwa, who secured interviews with priests, medicine-men, temple mediums and chiefs, and who prepared and annotated plans of the old Capital and of the Royal Enclosure. Further assistance has been rendered by Professors Frazer and Myers, and by Drs. Haddon and Rivers.

It is plain, then, that Mr. Roscoe had an excellent opportunity and that he has made the most of it. The Buganda of to-day is a very different country from the Buganda of 1870. Even in Mr. Roscoe's earlier years, "the old men who knew most about the former religious customs were not numerous; war and famine had killed most of them." Here, as in many other places, anthropology seems to have had but a single chance: let the man be wanting, and a certain store of knowledge is lost forever. Mr. Roscoe makes, on principle, no reference to published works, whether by himself (readers of the *Golden Bough* will be familiar with his papers in the *Journal of the Anthropological Institute*) or by other travelers; and though there are many books that treat of Uganda, from Speke's *Source of the Nile* to Tucker's *Eighteen Years*, it is safe to say that the present volume is and will remain the authoritative source-book for students of anthropology.

After a general survey of the country, and the life and customs of its inhabitants, come chapters dealing with the fate and fortunes of the individual: birth, infancy and puberty; marriage; sickness, death and burial. From these topics we pass to relationship, and to the clans and their totems. Then follow single chapters on the king, government, religion, and warfare; and then a group of chapters on industries, domestic animals, agriculture and food, hunting, markets and currency, and wells. A final chapter gives specimens of folk-lore tales and proverbs, and the book ends with anthropometrical tables, the two plans mentioned above, and a good index. Mr. Roscoe writes in a simple, straightforward style, and records his facts without straying into theory. He speaks naturally, in just the right scientific tone, of matters that are all too human. His accounts of such things as house building, fence making, canoe building, pottery, are very clear, and can easily be followed in the text alone; the photographs are literally illustrations, and not working diagrams. A good many of his observations, especially in contexts that interest the psychologist, have already been embodied in the *Golden Bough;* and the chapters thus lose something of their freshness; they do not, I need hardly say, thereby lose in value.

The photographic illustrations—most of them from plates made in the country; a few from museum specimens—are adequate. Figs. 20 and 24 represent the same tomb or temple under different names; but the text clears up the difficulty. It would, I think, have been worth while, particularly since the anthropometric tables are included, to insert a series of photographs of individual men and women, if only to differentiate the types (Bahima, Baganda, Basese) which the author expressly mentions; and it could have done no harm to add a few references to statements like that of p. 187, that the kings are in all probability of Galla descent.

E. B. T.

The Development of certain Instincts and Habits in the Chicks. By FREDERICK S. BREED. Behavior Monographs, I., 1911. pp. 78.

This study—the first in the series of Behavior Monographs—records the results of experimental observations on chicks from the moment of their birth, covering a period of twenty-five days. The observations were made at the Harvard psychological laboratory, and pertain to the development of the drinking and pecking reactions, especially the latter. Incidentally the author studied the development of certain habits in response to visual stimuli, their interrelation, and the conditions which influence their persistence.

For these observations an incubator and a brooder were used, so arranged that a complete life history could be obtained of each bird. The widespread belief that chicks peck their way out of the shell is discredited by the author, who argues from the position of the chick in the shell that this could not be the case. Pecking is scarcely possible, since the chicken's head is folded down over the breast. A lifting movement of the head to free it and the neck from their folded position is probably responsible for the breaking of the shell, but the author brings no positive proofs that this is so. On the contrary, he states that chicks only a few hours out of the shell may be seen executing "into the air" what might be called the pecking reaction, followed by a sudden clapping together of the mandibles. This matter remains to be settled by the use of a technique recently developed elsewhere which permits the keeping of developing chicks *in situ*, under continuous observation.

Concerning their drinking reaction it is commonly held that chickens swallow water instinctively, but that they must learn to drink by imitation, if not by accident. This does not square with the author's observations, for he found that chicks respond with the drinking reaction to various olfactory impressions such as, surface of white paper, edge of white glazed kymograph paper, edge of glass dish, and black leather watch fob; they do so without any previous experience and under conditions which preclude the possibility of learning by imitation or by accident.

Whether the visual stimulus caused by still water is sufficient to bring about the drinking reaction, the author is not prepared to state definitely. According to the view now prevalent, such a stimulus is not enough. It would be interesting in this connection to know whether the sight of still water evokes the drinking reaction in chicks deprived of water for a long time after hatching. This matter, too, is left unsolved by the present investigator.

We turn now to the main portion of the author's work, his investigation of the pecking reaction; it consists of three distinct movements,—striking, seizing, and swallowing. The accuracy of this reaction, which has always occupied the center of attention among experimentalists, depends upon the degree of accuracy of each of these movements. In other words, the reaction as a whole may be retarded or it may fail at any one of these three stages. The widely quoted observations of Spalding, who blindfolded his chicks with hoods as soon as they left the shell, showed a great accuracy in pecking, the chicks never missing by more than a hair's breadth even the most minute particles at which they aim; what is more, they do not attempt to seize anything beyond their reach. These observations produced a profound impression and have been quoted abundantly, among others by Romanes, in order to illustrate the perfect adaptation of means to end through the operation of instinct. Preyer was among the earliest investigators to doubt this

view, although even he believed that the accuracy of the pecking reaction at the very beginning is marvelously perfect in chicks. By studying the reaction in its three component acts,—striking, seizing, swallowing,—the author found that Morgan and Thorndike, among the modern investigators, are correct when they assert that the pecking reaction is far from being perfect at birth. But he also found no reason to share Thorndike's doubt that this reaction improves after birth. Breed is convinced that it does; but whether the improvement is "dependent upon practice or is the natural functional correlate of structural maturation independent of practice" he is unable to state. In the absence of data which would justify either position to the total exclusion of the other, Breed is inclined to accept a view which represents the middle road. Improvement, while clearly influenced by practice, does not depend altogether upon it. Both maturation and use improve function. The improvement would proceed without practice but is hastened by it.

The author's most important finding about the pecking reaction, requiring however additional documentation before it may be accepted as fully established, is that the manifestation of the pecking instinct was retarded by disuse; also, that the retardation was quickly overcome by use. A corroboration of these data would justify, in a great measure, the author's position that both maturation and use enter as factors in improvement. The observations showed that, in the ordinary course, the accuracy of pecking improved most rapidly at first, reaching, by the third day, an efficiency represented by 29.29 upon a scale of fifty. At the beginning of the eleventh day the efficiency reached a little over 40. From that time on the rate of improvement was exceedingly slow so that, at the end of the period of observation, on the twenty-fifth day, it registered a maximum of 42.57.

The greatest number of errors in the pecking reaction were observed during the seizing act. This condition persisted throughout the period of observation. Swallowing led to fewer errors, but the striking act was the most accurate. From this it may readily be seen how one, limiting one's observations to the striking act or depending chiefly upon it for an appraisal of the pecking instinct, may be led to assume a degree of accuracy which does not hold for the reaction as a whole. Doubtless certain of the results of the earlier investigators have been influenced by some such limitation as this; hence the discrepancy between them and the results of the present study.

The author believes that he has discerned in chicks some selective response to objects of different size, also to color, apart of intensity; but form tests were uniformly negative. His findings as to the effect of social influence are not definite enough.

There was no evidence to show conclusively that an established black-blue habit influenced in any degree the rate of acquiring the small-large habit. The chicks were trained in the black-blue habit by the use of the electric shock, in the usual manner. It was found that frequently the reactions were determined not by the free color, but by the one with which the electric shock was associated. Such actively negative reactions show that, psychologically, negation is not affirmation.

Five of the nine chicks thus trained showed perfect tests in black-blue after a thirty days' interval. The "index of modifiability" for the whole group of nine was 72.2. Nothing was learned about the time of appearance of the various reactions, such as flapping the wings, preening, chirping, scratching, twittering, or wiping the bill.

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BOOK NOTES

The mind of primitive man. By FRANZ BOAS. New York, The Macmillan Co., 1911. 294 p.

In these lectures, the author has brought together in available form for the general reader the results of his many years of special researches covering almost the entire field of anthropology, physical, linguistic, social, psychological. It is impossible within the limits of our space to do justice here to this admirable and comprehensive treatise. In the first chapter, he characterizes race prejudice which he shows has always been with us and is one of the great sources of error in this field. Then comes the influence of environment upon human types, then that of heredity, the mental traits of primitive and civilized man, race and language, the universality of cultural traits, the evolutionary viewpoint, some traits of primitive culture—these are the chief themes with a secondary and an appended chapter on race problems in the United States. One of the central thoughts running through the volume is that the intelligence and mental powers of primitive races is by no means so inferior as is generally thought, if indeed it is at all inferior to that of modern man. To have given valid and sufficient grounds for this conviction is to do great public service. But we believe that no impartial reader of the book, even though he may think that the author's view is slightly too extreme can fail to gain from it a more sane and wholesome estimate of what primitive man really is and stands for.

Examination of Professor William James' psychology. By IKBAL KICHEN SHARGHA. Allabad, Ram Narain Lal, 1909. 118 p.

This is a drastic criticism of Professor James' psychology which tries to show that most of his errors and much of his confusion is due to his inability to make up his mind as to the relation between brain and consciousness. Many very diverse points of view are cited by this author who concludes that "although all these shifting views are adopted and abandoned by turns, we find that Professor James, consciously or unconsciously, leans to the materialistic theory that the body is after all the real thing and that consciousness is a supernumerary phenomenon, that neural changes are invariably the cause of mental states and are in no way affected by them." To most psychologists the knowledge of the objective world based on sensations usually regarded as subjective affords a difficult problem, but James cuts the Gordian knot by maintaining that sensations are from the first in external space. He has certainly worked his hypothesis "for all it is worth" and "allowed psychology full headway on the materialistic tack."

Zur Psychologie und Ethik. Von WILHELM M. WUNDT. Hrsg. von Jul. A. Wentzel. Leipzig, P. Reclam, 1911. 206 p.

This little work attempts to present some of the most important points in Wundt's philosophy in quotations. The topics treated are: the origin of language and Märchen, the problem of experimental psychology, ethical norms, right vocation, etc. This, together with Wundt's primer, a little introduction of Rudolf Eisler and the book of Edmund

König constitute four very good introductions to Wundt's system now available to students of his works.

Die differentielle Psychologie in ihren methodischen Grundlagen. Von WILLIAM STERN. Leipzig, J. A. Barth, 1911. 503 p.

The writer attempts to bring together and make a rather exhaustive grammar of all the chief methods by which individual differences, especially among children, are studied. He takes up introspection, the non-experimental, experimental methods, the questionnaire, how to approach variations and correlations, the various methods of investigating individuality in order to make a true psychogram. The work is of extreme value and timeliness and its value is augmented by nearly one hundred pages of carefully selected bibliography. It is hoped that we can present our readers with a fuller review of this work a little later.

Experimental pedagogy and the psychology of the child. By ED. CLAPARÈDE. Translated from the 4th edition of "Psychologie de l'enfant et pédagogie expérimentale" by Mary Louch and Henry Holman. New York, Longmans, Green & Co., 1911. 332 p.

The translators have rendered us a real service in making this book accessible to English readers. The author desires to introduce the educator to psychological science and particularly to the psychology of the child. He finds the subject so diversified and the sources so scattered that there is great need of a guide and this need he attempts to supply. He groups his material under four chief heads, the problem, methods, mental development, and intellectual fatigue. This work admirably illustrates how very rapidly psychology is becoming a practical science.

The souls of black folk; essays and sketches. By W. E. BURGHARDT DU BOIS. Eighth edition. Chicago, A. C. McClurg & Co., 1909. 265 p.

This book contains fourteen chapters of perhaps the most scholarly of all the negroes in this country. He writes on the negro's spiritual strivings, the dawn of freedom, meaning of progress, the training of the black men, the black belt, the quest of the golden fleece, the sons of master and man, faith of the fathers, the passing of the first-born, Alexander Crummell, the coming of John, sorrow songs, Booker Washington, the wings of Atalanta. It is a pathetic book. The author's position is well-known. It is best defined by his relations to Booker Washington, whom he criticizes for holding that the South is justified in its present attitude toward the negro because of the negro's degradation, that his present failure to rise more quickly is due to his wrong education, and that his future depends primarily on his own efforts. Each of these he designates as a dangerous half-truth. This is indeed a remarkable book, full of pathos and insight, a book that everyone interested in this great national problem should read and ponder. It is the ablest book ever written in defence of the negro's position for it represents the standpoint of the progressive members of the colored race, who feel profoundly that the color line is bitter and cruel injustice.

Report of the control of the aborigines in Formosa. By BUREAU OF ABORIGINAL AFFAIRS. Formosa, Taikohu, 1911. 45 p.

This work seems to have been done under the direction of Rimpei Otsu, Superintendent of the Bureau of Aboriginal Affairs in the Gov-

ernment of Formosa. It does not pretend to give a full account of the control of the aborigines but in condensed form to tell what was done in controlling them to November, 1909. The work is very copiously illustrated and is of great interest throughout. It seems to us a model of its kind. Here, unlike our own dealings with the Indians, ethnological study and administrative efficiency have gone hand in hand and whatever is learned by anthropologists is immediately put to practice and there are no such watertight compartments as exist in Washington between the Ethnological and Indian Bureaus.

An unknown people in an unknown land. By W. Barbrooke Grubb. Edited by H. T. Morrey Jones. London, Seeley & Co., Ltd., 1911. 330 p.

This book is devoted to a discussion of the Indians of the Paraguayan Chacos and has six illustrations and a map.

The golden bough: a study in magic and religion. Part III, the dying god. By James G. Frazer. London, Macmillan & Co., 1911. 305 p. Third edition.

This third part takes up the question why had the king of the wood at Nemi regularly to perish by the hand of his successor. In the first part, the author told us why the king of the woods personated Jupiter, the deity of the oak, of thunder and of the sky. His answer to the question to which this volume is devoted is that the motive for slaying the man god is fear lest with the feeble body in sickness and old age his spirit should decay and thus the course of nature be imperiled, so this custom, wherever it prevailed, was a pathetic attempt to disengage the immortal spirit from its mortal envelope in order to arrest the decay of nature by retrenching the first symptoms of decay to make the great wheels of the world stand still and to keep it fresh, young and fair. Thus men have groped to find "the golden key that opes the palace of eternity." This at any rate is a happy dream. In the various chapters, the author discusses the mortality of gods, the killing of divine kings, slaying of kings in legends, the supply of kings, temporary kings, their sacrifice, succession to the soul and killing of the tree spirit, with a note on Chinese indifference to death.

The fairy-faith in Celtic countries. By W. Y. Evans Wentz. New York, Henry Frowde, 1911. 524 p.

The main topics in this charming book are: the taking of evidence, anthropological examination of it, the recorded fairy faith, the people of the Goddess Diana, Brythonic divinities and fairy tales, Celtic other-world, the doctrine of the rebirth. Then comes the cult of gods, spirits, fairies and the dead, with the testimony of archaeology, paganism and Christianity, and finally, modern science and the fairy faith. The Celtic doctrine of rebirth and the other world is scientifically explained.

The evolution of animal intelligence. By S. J. Holmes. New York, Henry Holt & Co., 1911. 296 p.

The author begins with reflex action and then treats tropisms, the behavior of protozoa, instinct, its evolution, modifications of behavior, pleasure, pain and the beginnings of intelligence, primitive types of intelligence in crustacea and mollusks, insects, lower vertebrates, mam-

mals, with a final chapter on the mental life of apes and monkeys. It is mainly a compilation, but is, as the writer intimates, somewhat fragmentary.

Scientific features of modern medicine. By FREDERIC S. LEE. New York, The Columbia University Press, 1911. 183 p. (Columbia University Lectures.)

The chief chapters are: the nature of disease and diagnosis, methods of treating, bacteria, prevention of infection, the problem of cancer, modern surgery, the rôle of experiment, the public and the medical profession.

Mental fatigue. By MAX OFFNER. Baltimore, Warwick & York, Inc., 1911. 133 p. (Translated from the German by Guy Montrose Whipple. Educational Psychology Monographs.)

This work collates, systematizes and appraises the mass of scattered and to most readers inaccessible material that bears upon this vital school-room problem. The author's bibliography was mainly German but the translator has added some of the best references available in literature. The work treats of the symptoms, measurements, methods, physiological and psychological, results, laws of fatigue, with certain general conclusions.

Biyonde cifrun (beyond zero). By GEORGE D. BUCHANAN. Boston, Buchanan & Co., 1911. 64 p.

The new is always growing within and without the world. The presence of matter does not exclude all else. Man has more than five senses. The chapters are how planets grow and wane; what we are and what death is; importance of life this side of the grave; a new doctrine. The idea of the book is to show that there are things beyond the zero of sense.

Laughter; an essay on the meaning of the comic. By HENRI BERGSON. Authorized translation by Cloudesley Brereton. London, Macmillan & Co., 1911. 200 p.

This work is based upon a revision by the author and the present translation is the only authorized one. It originally appeared in the Revue de Paris, hence it is simple, direct, formal. In France the book has reached its seventh edition and has been translated into many languages. Its success is due partly to the novelty of its explanation of the comic and partly to the fact that the author incidentally discusses so many other important questions.

Die Anfänge der Musik. Von CARL STUMPF. Leipzig, J. A. Barth, 1911. 209 p.

The author here greatly enlarges the Berlin lecture which had formerly been printed, which sets forth the fruits of ethnological studies on music in which, for more than one decennium, he has been occupied. This book is made up of two parts, the first on the origin and primitive forms of music. Here the writer treats new theories, origin of song, primitive instruments and their influence, polyphony, rhythm, song with language, developmental directions. And the second part is devoted to the songs of primitive people and the descriptions of primitive instruments. Every chapter of the book is illustrated with specimens of music and in the end there are cuts of barbaric instruments.

Lehrbuch der philosophischen Propaedeutik. Von RUDOLF LEHMANN. Berlin, Reuther & Reichard, 1911. 192 p.

This little introduction starts with an epitome of logic, including its conception and definition, judgment and idea, method and epistemology. Then comes a section on the theory of knowledge, then an outline of psychology, with special stress on the origin and lapse of concepts, the life of feeling and will, then the basal ideas of ethics, and finally an introduction to aesthetics.

Twenty-seventh annual report of the Bureau of American Ethnology to the Secretary of the Smithsonian Institution, 1905-06. Washington, Govt. Printing Office, 1911. 672 p.

This volume is devoted chiefly to a very luminous study of the Omaha Tribe of Indians by Alice Fletcher and Frances La Flesche. This monograph appears to be, as indeed we should expect from the authors of it, one of the very best in the entire series of the Bureau of Ethnology Reports.

Motive-force and motivation-tracts. By E. BOYD BARRETT, S. J. New York, Longmans, Green & Co., 1911. 225 p.

The chapters are: modern theories of will, object of the present research, motives, motive force and measurement, motivation tracts, evolution of motivation, automatism, hedonism, relativity of values, psychology of character. This is one of its ablest and original investigations in the important new field opened up by the Würzburg school.

The mental man. By GUSTAV GOTTLIEB WENZLAFF. New York, Charles E. Merrill Co., 1909. 272 p.

This little text-book is based largely upon Sanford, Barker, Jastrow, Seton, Tufts and Angell and discusses the physical basis, conscious life, will, habituation, heredity, impulse and instinct, feeling, sensation, fusion and discrimination, perception, unexplained mental phenomena and memory, imagination, conception, thinking, knowledge, suggestion, the self and mental types. A cursory survey impresses us that this is a pretty good elementary introduction along with the little handbook that goes with it.

Weltbegriff und Erkenntnisbegriff. Von VIKTOR KRAFT. Leipzig, Johann Ambrosius Barth, 1912. 232 p.

The focus of this book is idealism. The author first discusses the problem of the world idea and its historical development. He finds typical forms of the idea of the cosmos, viz., dualistic and monistic; under the latter, the views of psychophysical identity, materialism, idealism, positivism. He then takes up the typical ideas of knowledge and shows its relation to the cosmic idea. Then comes the foundation of realism and finally the doctrine the author advocates of transcendental ideality, the relation of objective ideality to the noetic consciousness.

Anleitung beim Studium des Baues der nervosen Zentralorgane im gesunden und kranken Zustande. Von HEINRICH OBERSTEINER. Leipzig, Franz Deuticke, 1912. 764 p. (Fifth enl. rev. ed.)

This book was for a long time a students' favorite and had passed through various editions, but was becoming a little antiquated. All interested in the subject will therefore thank the author that in this edition he has considerably increased his volume, adding new matter to date and also written over many parts of it which were in need thereof.

Psychologie und Pädagogik des Gedachtnisses. Von HANS SCHOENEBERGER. Leipzig, Otto Nemnich, 1911. 148 p. (Pädagogische Monographien, XII Band.)

The scope of this work can be suggested by the titles of its several chapters. The first resumés the most important results of investigations on the Ebbinghaus lines; the next describes the experiments of Müller and Pilzecker; the third, the investigations and results of a scientific and theoretical nature; and the fourth, those of a chiefly pedagogic and practical nature. The attempt of the book is to give a good outline of the present status of the problem.

Die Seele des Gesunden und Kranken. Von CARL SEHER. Berlin, Martin Warneck, 1910. 159 p.

The writer first treats the relations of body and soul, then thinking, willing, logic, psychiatry and certain diseases, the boundary between theology and medicine and then discusses certain psychic forces, such as the subconscious, hypnotism, symbolism, magnetism, spiritism, Christian science. The latter is treated in a very sensible way.

Studies in immunity. By JULES BORDET and his collaborators. New York, John Wiley & Sons, 1909. 545 p. (Collected and translated by Frederick P. Gay.)

Although for more than fifteen years a protagonist in the modern development of immunity, Bordet has continued an investigator instead of becoming a generalizer. He has been led by the thoroughness of observation and brilliancy of inductive reason and the collection of successive significant facts rather than to developing a theory. The work consists of thirty-one special papers, mostly by Bordet, but a few of which were written by his pupils, including Dr. Gay, the translator. Bordet has himself written a general resumé of the subject of immunity as a final chapter for this work.

Experimental studies in judgment: judgments of the comic. By H. L. HOLLINGWORTH. Reprinted from The Psychological Review, March, 1911, Vol. XVIII, pp. 132-156.

Difference-sensibility for rate of discrete impressions. By KNIGHT DUNLAP. Reprinted from The Psychological Review, January, 1912, Vol. XIX, No. 1, pp. 32-59.

Palmesthetic difference sensibility for rate. By KNIGHT DUNLAP. Reprinted from The American Journal of Psychiatry, November 1, 1911, Vol. XXIX, No. 1, pp. 108-114.

De l'attention. Par EUGENIA RIGNANO. Extrait de Scientia, Vol. XI, 6 ème Année, 1912, pp. 71-87.

On Freud's psycho-analytic method and its evolution. By JAMES P. PUTNAM. Boston, W. M. Leonard, 1912. 20 p. (Reprinted from The Boston Medical and Surgical Journal, Vol. CLXVI, No. 4, pp. 115-122, January 25, 1912.)

Insanity and criminal responsibility: preliminary report of Committee B of the American Institute of Criminal Law and Criminality. Reprinted from the Journal of the American Institute of Criminal Law and Criminality, November, 1911. 21 p.